Evolution, Creation, and Science

by

FRANK L. MARSH

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This Book Is Dedicated

To those who, in their search for truth, ignore unjustified authority in the field of science and keep their sincere minds alert to the recognition of facts regardless of where these may lead in the matter of conclusions.

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Unjustified Authority

I

THIS IS A TIME of decision for the races of men. Social forces are at work testing whether individual liberty and freedom shall perish under the ironshod heel of the dictator or maintain their place in the sun through valiant battle. Both wishful thinking and material evidence assure us that man may still expect to enjoy his own house as his private castle and his own thought mechanism as the arbiter of his philosophy. Some of the threatening forces are offensively obtrusive and generally recognized. Other enthralling elements are less generally recognized, although likewise plainly visible. The former components, largely political, are already being attended to by millions. The particular force of the latter group, to which this volume is addressed, is nonpolitical and exists in the realm of natural science. It concerns freedom of thought and opinion in the matter of biological theories.

II

In order to bring this force into the clear, let us consider for a moment some animate object in our immediate environment. Because of his familiarity, let us select the common tree squirrel. For a number of reasons this squirrel is an intriguing animal. He may arouse

our displeasure by showing a liking for things which we wish for ourselves, or he may draw our admiration through his lively actions and chic and mischievous appearance. Some see in him merely an object of the passing moment. Others observe the numerous adaptations he shows for his life in the trees, such as his quick eye, his supple muscles, his fine sense of balance, his facile feet with their all-important claws, and his flexible tail. This specific adequacy for his environment arouses questions in the minds of many observers which lead to long and careful study. This study will result in the formulation of a certain philosophy of life with regard to the tree squirrel.

Although we live in an age of great complexity in which division and subdivision of everything are omnipresent, still, in regard to these philosophies, it is refreshing to find that they all fall into one or the other of two groups. The observer's philosophy will either explain the nimbleness and alacrity of the squirrel in the tree as the result of an evolutionary process through which the animal has developed from a simple, possibly one-celled form into this efficient complexity, or will assume that the squirrel was created a squirrel by a Supreme Intelligence who shaped him to fit nicely into the arboreal environment.

III

We would like to think that a man is free to hold to one or the other of these philosophies with impunity as concerns the judgments and harsh opinions of his fellow beings. However, such is not the case. There has developed in recent years among our scientists an attitude of mind which amounts to a considerable force at certain

times in certain situations. This attitude is epitomized in the following quotation from H. H. Newman:

> "There is no rival hypothesis [to evolution] except the outworn and completely refuted one of special creation, now retained only by the ignorant, the dogmatic, and the prejudiced." [1]

Newman has kept the statement in the several editions of this book later than the one cited here. He evidently is sincere in his conclusion. A similar statement made by another zoologist while referring to what he considered a "pessimistic" view expressed by Bateson (1922) in the words, "the origin and nature of species remains utterly mysterious," [2] runs as follows:

> "Be that as it may, the fact remains that among the present generation no informed person entertains any doubt of the validity of the evolution theory in the sense that evolution has occurred." [3]

Neither will we question the sincerity of this writer. It would seem that sincerity should always be admired, but when it assumes the mien of a dictatorial force directed against others, its merit is definitely questionable.

IV

To the casual reader these statements may appear quite harmless. But actually they evidence an attitude of mind among present-day scientists which is regrettable. It has been my opportunity to observe the effect of this attitude upon young scientists. Having studied for a number of years in a small private college, I had the privilege of continuing my studies over a period of eleven years in three universities in this country. My personal

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[1] H. H. Newman, *Outlines of General Zoology*, p. 407.
[2] W. Bateson, "Evolutionary Faith and Modern Doubts," *Science*, January 20, 1922, Vol. 55, pp. 55-61.
[3] Theodosius Dobzhansky, *Genetics and the Origin of Species*, 2d ed., p. 8.

contacts with the scientists in these institutions were most pleasant and stimulating. However, during this experience I repeatedly observed the dissatisfaction in the minds of students over the existing "proof" for evolution. The thing which repeatedly won them over to acceptance of the theory was sheer weight of authority on the part of scientists through a not always highly refined method of browbeating. If the young aspirant was to keep face with the more seasoned scientists, he was obliged to accept the evolution theory.

In more than one public institution of higher learning in this country the candidate for a higher degree in science must at least claim to hold to the evolution theory of origins before he is considered to possess an acceptable scientific attitude and to be of sufficient caliber to be admitted to the final examinations. I wish to say here to the praise of the institutions I attended that such narrow-mindedness was not shown in them. All that was required was that a man present justifiable reasons for his position.

The lack of this truly scientific attitude among the scientific body in general is a deplorable situation. It is not so much premeditated and deliberate, I believe, as it is the natural result of a man in an all-absorbed manner gluing his eye to one very small portion of the natural world and becoming confused in the matter of what facts nature actually presents and what things, in the light of his theory, he wishes it would and believes it does present. His ardor for his opinion then leads him to trample roughshod over any who may entertain opinions differing from his.

Whether I am an evolutionist or a special creationist does not matter for the moment. The situation which

warrants the appearance of another more or less philosophical book in the field of science is the prevalence of this unjustifiable worship of authority which is decaying the hardy manhood of modern scientists just as truly as it honeycombed individualism in medieval times. When reputable scientists speak to us of facts which they have observed we listen respectfully and appreciatively, but when one of them arises and tells us that some theory of origins has been so completely verified as to immediately mark any dissenter as an ignoramus, then his fellows should likewise arise and call his attention to the fact that he is voicing an opinion on matters which even *his* experience and knowledge may not justify.

When a man states his philosophy concerning such a subject as origins which may involve forces which it is impossible to measure accurately, and in the same breath brands anyone who holds a different philosophy as a vain pretender to knowledge, my Quaker and Huguenot forebears arise and beckon to me to say a word in justification of the opinions of the minority. The interests of truth demand a clear statement of this opinion even though such an elucidation is not a popular occupation in these days when knee bending to authority in matters concerning scientific theories of origins is the thing in order.

V

Of the individual who keeps in mind the path that biological scientists have traveled during the twenty-two centuries since Aristotle (384-322 B. C.), a general mistrust of cocksureness of scientists over theories of origins is characteristic. Even a superficial perusal of this history reveals the relative nature of man's conception of truth.

A sad aspect of this matter is that we actually have no real ground for assurance that the modern conception of a self-designing and self-operating universe brings us any nearer to the correct explanation of the origin of life than did Aristotle's conception of a divine intelligence which was responsible for law-bound existence. His philosophy seems to have satisfied the scientists of late antiquity, and it became a welcome ally to the pious aims of the medieval church. The latter found indications of similarity between it and the divine power of the Genesis record of creation and thus received an idea of the cause of the world, which was then held to be scientific.

An investigation of the record, says Nordenskiöld,[4] shows that in Western Europe "the most decadent period of the Middle Ages really set in during the ninth and tenth centuries. . . . The one power that kept men together during that unhappy period was the Catholic Church; it gave . . . to culture fresh vitality" but "set up narrow limitations for its development." In order to study the sources of scientific knowledge then available in the works of Plato and Aristotle, Hippocrates and Galen, the church founded universities which became of fundamental importance to future scientific development. The science taught in these schools is known as the scholastic doctrine and was set forth by the schoolmen who in such centers as Paris, Oxford, and Leipzig numbered their students by the tens of thousands.

The High-Church theologians who held sway in these universities in the thirteenth century began to realize what a valuable ally they had in the Aristotelian philosophy, which they had at its first appearance mistrusted as

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[4] See Erik Nordenskiöld, *History of Biology*, pp. 75-91.

mere heathen delusion. During that century the canonized Thomas Aquinas had elaborated a system of thought which the Catholic Church has ever since held to be the only true one. According to this system, existence is divided into three "kingdoms," those of nature, grace, and blessedness. All men dwell in the first, while the latter two are attainable only by the members of the church. This view held that even the heathen may acquire a knowledge of nature, and no heathen possessed a deeper insight into nature than Aristotle; in fact, he was assumed to have explored the kingdom of nature with *unexcelled* wisdom. Consequently, the Christian researcher had only to rely upon Aristotle's explanation of nature and need not rob time from his endeavors in the kingdom of grace and his preparations for the kingdom of blessedness in order to study nature at first hand.

In this way the enthralling worship of authority in things scientific settled upon the centers of scientific study. Its heavy hand was not lightened in the least by the giving of official sanction at that time to the "idealistic" view of Plato that ideas do not exist in things but rather existed before things. As an illustration of the effect of this attitude upon the study of natural history, the well-known story comes to us of how the learned ecclesiastics disputed as to how many teeth the horse should have according to Aristotle, instead of looking into the mouth of a live horse to see for themselves.

The tendency was thus continually away from nature into the works of authority. If a census of the "scientists" had been made as late as the beginning of the sixteenth century and after the high tide of medieval scholasticism had passed, they would have been found holding almost to a man to the hidebound teachings of authority and,

at the same time, arguing very ably that our cosmic system had its origin in a Supreme Intelligence and that organic forms were directly or indirectly the work of His hands. Anyone who had the temerity to suggest that natural forces were responsible for origins would have found it immediately necessary to recant such heresy or be excommunicated and suffer the hardships of economic boycott.

Those "scientists" were sincere in their opinions, just as sincere as are the evolutionary scientists of today. This swinging of the pendulum of human opinion, even in scientific circles, from one extreme to another is a characteristic of the historical record of man. If scientific development were to go on for another five hundred years, is it not possible that the now-prevalent scientific theory of origins might look just as absurd to the scientists of that future day as hypotheses of the schoolmen of five hundred years ago look to the scientists of our day? The answer may be, "Possibly, but our theory is built upon facts and the theories of the scholastics upon suppositions." True, scientists of our day think they are building upon facts. But is it not possible that the "facts" upon which the theory of evolution is built are merely the arbitrary conclusions of overly wishful observers? The schoolman *thought* he had good proof that this earth was the center of the universe. After all is said and done, is not all scientific knowledge merely relative and definitely amenable to revolutionary changes even in a few years of time?

With these considerations in mind it would seem that the narrow and dictatorial scientific authority so general in our land today is definitely regrettable. We are not *the* people necessarily, and wisdom will not of necessity die with us. The mental banishment of a scientist from the society of the learned and broad-minded might con-

stitute as unjust a procedure today as did the attempted excommunication of Galileo from the church because *he* thought that the facts showed that the earth was *not* the center of the universe.

VI

The scientist is ever on the search for truth, and for that reason should never close any door which may offer an avenue of possible light upon an understanding of facts of natural history. Because the theory of special creation as an explanation of origins is so grossly misunderstood and misrepresented among men of science today, I propose to set forth, as far as my understanding of the theory goes, the point of view of the special creationist. This volume presents as careful an analysis of those facts in nature which bear upon this subject as this limited space will allow.

Certainly every informed modern scientist should know what is included in the theory of special creation, and it is hoped that this new understanding will help in solving the great problem before us of explaining the origin of the thousands of "species" of plants and animals living on the earth today. The only authority that the scientist can accept as a scientist is the authority of the facts of natural history. As far as it is humanly possible let us forget our pet theory of origins for the moment while we inquire into the *facts*. With the facts before us, let us fit them into whatever theory they seem to justify.

Evolution and Special Creation Defined

I

BEFORE GOING ANY FURTHER into a discussion of this subject, let us make sure that we all have the same mental picture of what is meant in this discussion when reference is made to evolution and to special creation. To a considerable degree, a definition of either of these processes varies with the individual who is making it. It would not be fair to modern evolutionists if we were to seek a definition from such earlier proponents of theories of evolution as Anaximander, Aristotle, Augustine, or Thomas Aquinas, or even of Lamarck or Darwin or de Vries.

The conception of the path that evolution has followed has changed decidedly through the centuries. Even today anyone who begins to inquire among scientists concerning the meaning of evolution is soon considerably confused because of the great variety of different answers. A late head of the zoology department of one of our universities once explained to me that evolution had brought living things to their present levels, and then had gone off the job. It was his opinion that evolutionary forces were no longer working. Of course, Neo-Lamarckists and Neo-Darwinists, and Psycho-Lamarckists and Psycho-Darwinists, would differ pointedly with him in

his explanation of the process. In some parts of the land mechanistic evolutionists predominate and in other parts theistic evolutionists, the kind in any section depending upon the influence of authority which works from various centers of thought in our country.

In view of this variety of definitions, we will have to decide upon one in order to limit the subject to the scope of this book. Let us select the description given by Theodosius Dobzhansky, professor of zoology, Columbia University, in his revised edition of *Genetics and the Origin of Species*. This description has the good points of being both very recent and widely accepted. He says of this theory:

> "The theory of evolution asserts that (1) the beings now living have descended from different beings which have lived in the past; (2) the discontinuous variation observed at our time level—the gaps now existing between clusters of forms—have arisen gradually, so that if we could assemble all the individuals which have ever inhabited the earth, a fairly continuous array of forms would emerge; (3) all these changes have arisen from causes which now continue to be in operation and which therefore can be studied experimentally." [1]

Many very unfair and inaccurate statements against evolution have been made by individuals, not scientists, who held to a theory of special creation. Very likely these folk were honest and sincere but were activated by zeal instead of knowledge. Common claims made by them are that evolution teaches that man is a made-over monkey; that evolution is a theory that all living forms are tending toward man; that all changes in organic evolution are necessarily progressive, etc. In order to help correct some of these misconceptions concerning evolution and to picture further the viewpoint of the evolutionist,

[1]Theodosius Dobzhansky, *Genetics and the Origin of Species*, pp. 7, 8.

I will include H. H. Newman's list of "What Organic Evolution Is Not."

It is as follows:

"1. The evolution doctrine is not a creed to be accepted on faith, as are religious faiths or creeds. It appeals entirely to the logical faculties, not to the spiritual, and is not to be accepted until proved.

"2. It does not teach that man is a direct descendant of the apes and monkeys, but that both man and the modern apes and monkeys have been derived from some as yet unknown generalized primate ancestor possessing the common attributes of all three groups and lacking their specializations.

"3. It is not synonymous with Darwinism, for the latter is merely one man's attempt to explain how evolution has occurred.

"4. Contrary to a very widespread idea, evolution is by no means incompatible with religion. Witness the fact that the early Christian theologians, Augustine and Thomas Aquinas, were evolutionists, and the majority of thoughtful theologians of all creeds are today in accord with the evolution idea, many of them even applying the principle to their studies of religion; for religious ideas and ideals, like other human characters, have evolved from crude beginnings and are still undergoing processes of refinement.

"5. The evolution idea is not degrading. Quite the contrary; it is ennobling as is well brought out by the classic statement of Darwin [*Origin of Species,* 1859, last paragraph] . . . and by that of Lyell. . . .

"6. The evolution doctrine does not teach that man is the goal of all evolutionary process, but that man is merely the present end product of one particular series of evolutionary changes. The goal of evolution in general is perfection of adaptation to the conditions of life as they happen to be at any particular time. Many a highly perfected creature has reached the goal of its evolutionary course only to perish because it was too highly perfected for a particular environment and could not withstand the hardships incident to radically changed world conditions. Many evolutions therefore have been completed, while others are still awaiting the opportunity to speed up toward a new goal.

"7. Evolution is therefore not entirely a thing of the past. Obviously some species, including Man perhaps, are nearly at the end of their physical evolution, but there are always certain general-

ized plastic types awaiting the next great opportunity for adaptive specialization." [2]

II

In selecting the essential essence of the evolution theory which contrasts with that of the theory of special creation, I would suggest that it lies in the fact that all evolutionists feel certain that the Genesis story of creation of separate kinds of animals by a Creator during the six twenty-four-hour days of creation is not a true account of origins. They feel very sure that Genesis is wrong, but they have not yet discovered to the extent of any very general agreement just what forces *have* caused kinds to arise from simpler ones, i. e., produced what Genesis says was formed by a Creator.

There is a group of scientists of the theistic school who claim to accept both evolution and Genesis and in attempting to hold to this compromise position set forth a day-age theory in which each day of creation is conceived of being thousands of years in length. In this discussion, however, these day-age advocates are placed with the other theistic evolutionists because the starting point, i. e., one-celled forms, and the developmental processes accepted by them are those of the evolutionists. On this one point of the simple origins of all plants and animals, evolutionists everywhere seem to be in fairly general agreement.

III

With regard to a definition of the theory of special creation, I may say that after a great deal of searching through scientific books I have not yet uncovered a fair

[2] H. H. Newman, *Evolution, Genetics, and Eugenics*, pp. 8, 9.

and correct description of it. Special creationists on their part have been so busy anathematizing evolutionists and endeavoring to point out weaknesses in theories of evolution that they have largely overlooked placing a clear definition of their own before the public. As in the case of evolutionists, there is a great degree of difference of opinion among special creationists with regard to just what they do believe. It would be impossible for me to give a definition of their theory which would suit everyone. Therefore, I will define it in a way which I think is most in harmony with known facts. My description of the theory is the one which I believe is necessary in order to give it a place in the world of common sense. It is possible that a restatement of the theory of special creation will likewise be a help to special creationists in the matter of clarifying at once the breadth and the limitations of their theory.

Any one of the definitions of special creation found in college science texts would do to illustrate their general shortcomings. Let us select the one found in a college text in botany which is probably used more generally in this country than is any other botany text. In a discussion of theories, we read:

> "The first is the theory of special creation, which assumes that each species that exists or ever existed was separately created, and that each of the specially created individuals of a species was endowed with the power of producing other individuals like itself, but without ability to give rise to individuals differing from it." [3]

This definition gives a very inaccurate idea of the theory of special creation. This is true for at least two reasons; first, the theory of special creation does not assert

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[3] R. M. Holman and W. W. Robbins, *A Textbook of General Botany for Colleges and Universities*, p. 338.

that all the modern "species" on the earth arose by separate acts of creation; second, the theory does *not* assert that individuals do not have the ability to give rise to individuals differing from them. The second assertion is entirely too vague to be accurate. In the production of differing individuals, special creationists recognize the facts associated with the operation of natural forces, e. g., mutation, even using the term in its broadest sense, just as fully as do the evolutionists. It has been this characteristic of evolutionary scientists, unintentionally and otherwise, to misstate the assertions of the theory, which has had much to do with the general disfavor into which the theory of special creation has fallen today. Scientists are purported to be energetically engaged in the search for and promulgation of truth. Therefore they should be very careful to see that definitions of theories of origins are truthfully stated.

IV

In addition to the general inaccuracy of definitions of special creation is a type of propaganda to which I believe attention should be called at this point. Let me illustrate what I mean by quoting from a zoology text which has been continued through several editions and which has exerted considerable influence upon college and university students. From a discussion by this author of what he believes are weaknesses in the theory of special creation, we read the following:

> "Again, if the first woman was made out of the removed rib of the first man, we should expect males to possess one less rib than females. The fact is, however, that no such difference between the sexes exists." [4]

[4] H. H. Newman, *Outlines of General Zoology*, p. 403.

When it is remembered that this author is a supposedly reputable zoologist who specializes in the field of genetics, this statement is incomprehensible. Even a very superficial knowledge of genetics will enable one to see its inaccuracy. The account in Genesis[5] states that sometime after Adam was created, the Creator caused him to sleep, and while he slept a rib was removed. Everyone who has read at all in genetics knows that mutilations of the bodies of parents are not passed on to their progeny. Adam's sons who were born a year or more after this operation would have just as many ribs as Adam had before one was removed. This author stands as one of the main supporters and militant defenders of the theory of evolution in this country. But when he endeavors to foist such untruths upon students in an effort to make the theory of special creation appear ridiculous, one is led to doubt the accuracy of statements in favor of evolution which he may make while attempting to cause his pet theory to appear attractive. Professorial inaccuracies of this sort in company with browbeating have influenced many gullible and timid students to accept the theory of evolution as the course of least resistance or even as a means of self-defense.

V

As in seeking a definition of evolution, we will not go back to the special creationists of former centuries for a definition of the theory. Special creationists of today do not accept the definitions given by even Linnaeus or Agassiz.

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[5]Genesis 2:21, 22.

The essential principles of the theory were set down by the author of Genesis long before such early evolutionists as Anaximander and Diogenes of Apollonia were born. The basic assertions of the theory have not changed since the writing of Genesis. In that character it differs materially from the theory of evolution. The latter has evolved and accumulated from generation to generation, each generation in turn discarding the specific causal forces proposed by the preceding one. By contrast, the theory of special creation in its essential points has come down through the centuries without change. This is true because anyone wishing to know the theory must turn to the statement of it in Genesis and not to the explanation of it that was current in medieval times, nor to the personal interpretations given by Linnaeus, Agassiz, or others.

Not all modern creationists accept Linnaeus' conception of the theory, because, for example, he indicated through his assignment of separate species names to the European bison, or wisent, *Bos bonasus* Linnaeus, and the American bison, *B. bison* Linnaeus, that he considered them to have originated by separate creative acts. Genesis does not so state, and facts relative to hybridization between these two "species" lead many special creationists of today to consider it much more sensible to assume that both of these "species" had a common ancestor. In this they differ quite markedly from Linnaeus in his interpretation of the theory. Neither will they all agree with Agassiz that the blind fishes in Mammoth Cave were formed blind and placed there by the Creator. Genesis does not say so, and facts in nature regarding these fish and their surroundings indicate that such was not their origin.

VI

It is my opinion that the theory of special creation asserts that (*a*) the organisms now living have descended from beings of the same kind which were created; (*b*) within created kinds processes of change may occur to such an extent as to produce individuals differing to a considerable degree from their parents, yet never sufficiently different to constitute new kinds, e. g., the several races of men from one original pair; (*c*) any physical or mental changes which have appeared in organisms since creation have arisen through natural causes which now continue to be in operation and which therefore can be studied experimentally.

In order to clarify the first two assertions, I will say that "kind" is *not* used synonymously with the modern term "species." The "kind" possibly refers to markedly different animals, such as the amoeba kind, the earthworm kind, and the squirrel kind, and to plants in which the differences are as great as are found in the liverwort kind, the fern kind, and the sunflower kind. The variation referred to in the second assertion may be so wide as to produce new "species" or even new "genera" in the sense that modern systems of classification use these terms; e. g., it is assumed that the wisent and the American bison, two different "species," may have arisen from the same ancestor—an oxlike kind of animal.

VII

Any scientific theory must be in harmony with all known *facts*. If it be negated by as much as one of these facts it is a faulty theory. The purpose of the succeeding pages of this volume is to discover whether the theory of

special creation as a theory of origin of modern forms is in harmony with all the facts.

In view of the definitions of special creation heard in most college and university classrooms and written in textbooks generally, the above definition possibly appears quite startling. The special creationist builds this theory from the statements in Genesis in conjunction with the facts in nature. One source complements the other. This union of Bible statement with all scientific facts enables the biologist to form a complete theory which includes the whole span of living things from their origin to the present moment.

VIII

Two important differences between the theory of evolution and that of special creation are obvious. The most noticeable one is that although they both purport to be theories of origins, still the latter is the only one which actually makes an assertion regarding the beginning of plants and animals. The theory of evolution is definitely inadequate in this point. The clarity of this matter of beginnings is a source of special joy, shall we say, to the creationist, while to the evolutionist it merely remains an unsolvable problem. If he assumes that natural forces are alone accountable for living things, he at once places himself face to face with a problem impossible of solution. His better judgment tells him that natural forces do not make it possible for living forms to arise spontaneously. If he assumes that a Supreme Intelligence placed the first forms of life on this earth, he is well on the road to being a special creationist. For these reasons the evolutionist has little to say with regard to the first appearance of life. Man has tried for centuries to discover how life

began. His conclusions are even at the present time extremely various and hazy. It would seem that one in our day is justified in assuming that the solution of such a problem may require a higher mental gear than man is capable of mustering.

The special creationist believes that Genesis was given him to provide for just this deficiency in man's power of discovery. The Creator has not solved for man the riddle of the origin of multitudinous modern variations. He has merely described the beginnings of life, revealed the causal force which energizes all natural processes, and indicated a few basic principles which underlie the whole intricate structure. According to the point of view of the special creationist it is the scientist's duty and privilege to uncover these natural laws which are operating to produce the delightfully complex world of living things. Man is not being bottle-fed by his Creator. Rather, a diet of solid meat is set before him.

IX

The second marked difference in these two theories is that which concerns the amplitude of change produced by the natural processes now in operation. The theory of evolution asserts that these processes know no bounds in the matter of production of change—a one-celled form today, a complex organism consisting of millions of cells a thousand million years later. The theory of special creation asserts that processes of change operate within clearly defined boundary lines, often causing great changes within a kind but never changing one kind into another.

Many evolutionists, upon reading the above por-

trayal of the assertions of the theory of special creation, will say of the adherents of the theory, "They are evolutionists!" Whether they are or not depends upon the reader's conception of evolution. If by this term he merely means the changes in appearance sweet peas have undergone in the last two hundred and forty-four years whereby we now have more than five hundred entirely distinct colors, tints, shades, and combinations within the Spencer or waved form alone, which have all developed from a single kind of sweet pea since 1700; if by evolution he merely means the changes that dogs have undergone which furnish us with over two hundred distinct breeds today, all of which have developed from a very few wild dogs; if by evolution he merely means the changes that man has experienced in his physical body since his first appearance as one pair six millenniums ago, whereby some writers [6] now assign to man at least one hundred and sixty distinct breeds; if these processes are what the reader holds to be evolution, then special creationists are evolutionists. But wait until I turn the trick. If these changes are what the evolutionist is referring to when he says he is an evolutionist, then in actuality he is not an evolutionist but a special creationist. Why? Because these changes are definitely not producing new kinds, but are all within the doctrine of Genesis; i. e., *they merely illustrate the fact that each reproduces "after his kind."* The five hundred varieties of sweet peas are still sweet peas, the two hundred breeds of dogs are still dogs, and the one hundred and sixty breeds of men are still men.

This very matter of variation within the kind is the crux upon which the whole business of differences between

[6] Griffith Taylor, *Environment and Race.*

evolutionists and creationists balances. The evolutionists have permitted themselves to become confused over variation to the point that they, too, often fail to recognize its limitations. From appearances, they have, in some way hard to understand, become sold to the idea of evolution, then have laudably combed the world for proof. In this way considerable data on *variation* have been pulled together and thrust into our school texts in an endeavor to prove that *evolution* has occurred and is now taking place. During the last twenty-five years I have carefully examined a great number of textbooks in biological science, and without exception they present examples of *variation within well-defined limits* instead of evolution—it may be snails from Tahiti, sweet peas from the greenhouse, or the trail from any of our present domesticated plants or animals back to their wild and economically inferior ancestors. Unwittingly these evolutionists have furnished a fresh demonstration of the truth of the theory of special creation with each additional case presented.

X

Darwin, the great emancipator of the imaginations of men of science, in more than one notorious instance failed to observe the bounds set in nature for variation. In fact, he claimed to recognize no law-bound necessity in existence. In his first edition of *On the Origin of Species by Means of Natural Selection* he speaks of bears swimming in North American rivers and snapping at insects in the water. He thought that it was not impossible that, if this kind of food were abundant and there were no serious competition, some of the bears would become aquatic animals and would gradually acquire

larger and larger mouths, eventually becoming as monstrous as whales.[7] True, Darwin modified these statements in later editions, but the sky was still largely his limit when he began to speculate. This mantle of freedom with regard to the building of theories has fallen on the majority of scientists today, and they with Darwin speak unjustifiably of unlimited variation.

I feel to extend this word of caution that we take care not to get our theories so deeply in mind that we can no longer tell the difference between evolution and variation. Evolution, when used as the evolution theory demands, means the *changing of one kind of animal or plant into another.* With this understanding in mind it will be seen that these two theories of origins are definitely different. To prove this assertion which concerns evolution, the evolutionist must present evidence from nature that *one kind of organism has changed into another kind,* while the special creationist must demonstrate that nature contains *no evidence that such a change has occurred.* It would seem that such propositions are capable of definite proof or disproof.

XI

It will be seen that the last assertion of evolution as presented by Dobzhansky, and the last one of special creation as I have presented it above, agree. Dobzhansky has focused all three of his assertions upon the present. Observe in assertion (1) "the beings now living," in assertion (2) "the discontinuous variation observed at our time level," and in assertion (3) "causes which now continue." This is a sensible thing to do

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[7]Charles Darwin, *The Origin of Species by Natural Selection,* 1860 ed., p. 165.

when it comes to the matter of demonstrating whether evolution is a fact or a theory. The special creationist assumes a supernatural display of force in the early history of biological forms, but, fortunately, many creationists also assume that any changes from the original condition have occurred through the operation of what are commonly called natural forces. It therefore seems that the proponents of these two theories are on rather common ground in many ways, and that the hope of agreement through a correct understanding of natural forces is definitely bright.

In order to summarize the above assertions of the theory of special creation as I understand it, and in order to clear the air a little further in the matter of the viewpoint of the special creationist as I see it, I will follow Newman's lead and close this chapter with a previously published [8] list of things which I believe the theory of special creation is not, or does not do.

1. The doctrine of special creation is not merely a creed to be accepted by faith. It appeals to the spiritual faculties, and also to the logical. Every fact of natural science is explainable logically from the viewpoint of special creation. In actual practice, less faith is necessary in its application to nature than in the acceptance of the theory of organic evolution.

2. It does not teach that man today is as he was created. But rather, that the modern races are degenerated forms of that first man who was formed of dust by his Creator and in His image. These changes have been accomplished through heritable differences which appeared and are transmitted by laws of genetics.

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[8] Frank L. Marsh, *Fundamental Biology,* p. 92.

3. It is not synonomous with the "special creation" doctrine held by the church of the Dark Ages and later by such biologists as Linnaeus and Agassiz. They formed an opinion of the teaching of the Scriptures, then warped nature around to fit. Today, nature and Scripture are studied concurrently, and conclusions are then drawn from their combined testimony.

4. It does not tend unconsciously to exalt man and lead his mind away from his Creator. Beginning in God and existing momentarily through His continuously applied power and care, nature is at once a source for spiritual inspiration and for adoration of the Creator-Sustainer. Such a doctrine condones no bestial behavior in man on grounds of animal ancestry.

5. It does not teach that man can be degraded by crossing with beasts and thus produce half-human races. Furthermore, it does not teach that monkeys are similar to humans in body build because they originated in a man-beast cross. Neither Inspiration nor nature furnishes any basis for the assumption of such ancestry.

6. It does not teach that the fauna and flora of caves or oceanic islands were created *in situ*. All dry-land animals were destroyed in the universal deluge, with the exception of those preserved in Noah's ark. The descendants of these survivors have repopulated the world from a center of distribution located in the mountains of Ararat in Armenia. Plants have been redistributed from various points of flood survival.

7. The doctrine of special creation does not teach that nature is static. One man was created. Through processes of mutation and hybridization within mankind, we have all the various races and types or breeds of modern man. Like variation has occurred and is occur-

ring among all animals and plants. The dictum "after its kind" is a law of reproduction evinced by the impassable gulf which exists today between the Genesis kinds. All genetical processes, such as mutation, hybridization, segregation, recombination, changes in chromosome number, changes in gene arrangement, etc., are merely productive of new races, strains, types, subspecies, or even new "species" and "genera" in the eyes of taxonomic "splitters," but are always within the Genesis kind. To understand this, it must ever be borne in mind that the modern "species" is, in most cases, *not* synonymous with the "kind" of Genesis.

★ ★ ★ CHAPTER THREE ★ ★ ★

Scholasticism and Modern Theories of Origins

I

IN CHAPTER ONE we have recalled a common characteristic of man with regard to his theories, the tendency to swing from one extreme to another. During the Dark Ages all processes in nature were conceived of as being accomplished "by the grace of God, amen," in a most literal way. It was as if each separate phenomenon was achieved by the Creator's stooping down from heaven and, in some direct yet mysterious and irregular way, with His finger pushing the process through to its conclusion. In our day, as evidenced by the third assertion of evolution listed in Chapter Two, evolutionary scientists very commonly believe that living phenomena are the result of purely natural processes which are not necessarily dependent, even indirectly, upon a Higher Intelligence. This pendulumlike swing in man's opinions and theories is one of the outstanding characteristics of the genus *Homo.*

II

Before passing to a consideration of modern processes of change, I wish to inquire a little further into the historical record of biological theories in order to see whether we can understand more clearly the present-day

assertions of evolutionists and special creationists. It may be possible that a correct reading of the historical background will assist in clearing away still more completely the false accusations which have been laid at the door of modern special creationists. During the consideration of this historical record it will be necessary to keep in mind that the biological views of the schoolmen of medieval times *were an outgrowth of an incorrect understanding of the theory of special creation.*

The Genesis record, penned many centuries before the days of the scholastics, contains the only true expression of the theory of special creation. The brevity of this record has made possible the later addition of many privately conceived notions and of unnecessarily narrow opinions of what Genesis really states to be the truth with regard to origins. These later interpretations can no more fairly be held against the pure theory of special creation than can the speculations of Darwin be justly held today against the theory of evolution.

Attention has already been called to a fundamental difference between the two theories in the matter of their origins. The theory of evolution has accumulated, and its correct assertions must ever be sought at the hands of the most modern philosophical scientists in order to get the latest edition of opinion on the matter and thereby a "correct" understanding of the theory. By contrast, the basic assertions of the theory of special creation can be found only by chipping away the untempered mortar which has been used in rounding out its contour, thereby disclosing once more the fundamental statement of fact. The baring of this original framework often reveals that an entire change from the primal plan occurred as the mortar was added. In supplying more details to the basic

statements, most certainly nothing should be added which does not agree with scientific fact. The special creationist conceives of the Creator as also being the Author of the Bible and the great Maintainer of present-day natural processes. Therefore nature and Revelation must of necessity, because of the identity of their Author, agree.

In Chapter One we have directed attention to the extreme bondage to authority in which all scientists were chained during the Dark Ages. This was upheld not only by the authority of the church, but also by the boundless respect which that age entertained for antiquity. True, the bondage to authority was not universally voluntary by any means. Even though authority might demand that the medieval scientist agree that black was white because Aristotle or Galen said so, still down in the hearts of many students of nature slumbered the conviction that, authority notwithstanding, black was black.

But however many defects could be proved against the old system of the schoolmen in detail, it nevertheless remained unaffected, owing to its consistently carried out construction. An entirely new system of thought seemed to be required in place of the old before the latter could definitely break down.

The control of the entire economic structure of that day by the church made it extremely uncomfortable for any who chose to differ publicly with authority. Careful observers saw that the schoolmen were wrong in many of their doctrines relating to natural history, but to differ with them was as pleasant as thumping one's head against a granite wall.

However, let us not lose sight of the fact that this state of bondage was *not* brought upon scientists as a result of the general acceptance of the theory of special

creation by the schoolmen. Rather, it resulted from a very narrow and hidebound conception of the meaning of Bible statements in the minds of the leaders of thought in the church of that day. To illustrate, the Bible does *not* teach that the earth was the center of our solar system or that laws of chemistry and physics do not operate to accomplish living processes of plants and animals, but the scholastics so interpreted these statements and persecuted men who had the courage to teach any other explanation.

IV

Further illustration of the peculiar point of view held by the schoolmen is to be found in the then current explanation of the circulation of the blood. These biologists assumed in a speculative manner that the heart, in a passive sort of way, performed its most important function of *dilatation,* thereby allowing the blood to move from the veins into its chambers. The reason for the entrance of blood into the heart was that it might there receive a "vital spirit." Having obtained this necessary essence from the heart, it was enabled to bound out through the arteries, into the veins and back to the heart just in time to receive a necessary renewal of the all-important *spiritus.* Thus, according to the general conception, the blood *moved itself* by means of this mysterious spirit. In addition to being a center for the impartation of this vital spirit, or pneuma, according to Aristotle and Cesalpino the heart was also the center of the intelligence.

Because the schoolmen, *who posed as special creationists,* held to these and numberless additional inaccurate views, modern scientists are generally of the opinion that the theory of special creation today is just as inaccurate

as was *the interpretation* of the theory among the schoolmen of the Dark Ages. They fail to distinguish between the scholastic interpretation and the true interpretation.

It should be held clearly in mind that the special creationist looks to the Bible as the expositor of the theory of special creation, and that that source does not state that such is the mechanism of blood circulation nor that the heart is the seat of the intelligence. Blame for such a narrow conception of nature lies at the door of the schoolmen in *their interpretation* of Scripture and not in the record itself. To understand that this statement is true, one has but to read the Bible carefully for himself.

V

As we have already observed, however, even authority of the church and respect for antiquity were incapable of restraining all men from a firsthand study of natural phenomena. While the large majority of scientists were content to remain engaged in the comfortable pursuit of classroom speculation, others were courageous enough to rely upon their senses and to pioneer in the unhealthful business of revealing to the public that black was, after all, not white but black. The philosophy of the schoolmen lacked the possibilities of free expansion as new facts were discovered and was therefore doomed to be shattered by the unrestrainable intellectual growth that began in the Renaissance. Starting in Italy among men who had never really broken connection with classical antiquity and where the system of the medieval schoolmen had always been a sickly institution, it rapidly swept through the fifty million people of Europe.

The absolute value of truth which the schoolmen had

credited to the formulae of the church, the scientists of the Renaissance, known as the Humanists, assigned to the writers of antiquity. These men regarded Aristotle with possibly as much respect as did the scholastics of the Middle Ages, but they now secured access to the classical writings without the restrictions of the church to limit their interpretations.

Newly found classical authors and the great geographical discoveries of the day stimulated ideas for special research in scientific fields which resulted in progress far beyond that of Aristotle and Galen. Thus the Humanists, while continuously bowing respectfully to antiquated authority, were nevertheless moving away from it through the establishment of facts which made it impossible to longer reconcile the results of their research with ancient and crude opinions. It was largely through the work of Galileo (1564-1642), Boyle (1627-1691), and Newton (1642-1727) that the scholastic philosophy of the Middle Ages, a system of stagnation and obedience to authority, came to its end. The work of these three men effected a swing of world opinion in favor of a recognition of law-bound force, apparently impersonal, and operating by natural necessity.

VI

The actual deathblow to Aristotle's biological theories, curiously enough, came from a man who had the greatest respect for his teaching, yet who through the establishment of certain facts, made it impossible to follow it. This blow descended at the hand of the English anatomist William Harvey (1578-1657), who in 1628 published his exposition of the circulation of the blood, in

which he proved that the blood moved through the blood vessels, not by the agency of a vital spirit which it had received in the heart, but by a purely mechanical process. Although himself a convinced disciple of Aristotle, Harvey thereby laid the foundations of that modern scientific theory of the phenomena of life which follows the same methods as those applied to the investigation of phenomena in inorganic nature.

This discovery of Harvey's caused a tremendous sensation and marked a great change in scientific study. Harvey was a private investigator, without connection with any of the universities. Descartes, Spinoza, Leibnitz, and van Helmont likewise worked independently. Thus in the seventeenth century and still more so in the eighteenth century the universities ceased to be the centers of scientific progress and became seats of unproductive conservatism as regards scientific matters. The vastly important work of pioneering in scientific investigation was taken over by private scholars. It is but natural to expect these workers to have little in common with the church scientists. The latter remained hopelessly conservative and mechanically repeated the formulae inherited from the Middle Ages, and came to represent in the minds of the independent scientists the personification of dogmatism, prejudice, and ignorance in the field of scientific study. Unfortunately, the evolutionary scientists of today hold the same unflattering opinion of their creationist colleagues. This present-day opinion with regard to creationists is largely due to a failure on the part of evolutionists to observe the vast difference between the pure theory of special creation and the narrow and impossibly conservative interpretation of that theory which was promulgated by the schoolmen.

VII

It is impossible within the confines of this small volume to trace in any satisfactory detail even the bare essentials of the story of development of biological science after it left the university system and began to be championed here and there by independent workers. A natural result of individual independence was the development of a vast tangle of facts and opinions among scientists, and speculation beat about quite helplessly among the waves of confusion in comparison with its experience within the comparatively safe harbor of Aristotelianism. The confusion of thought even in individuals is illustrated by the perfectly serious discussion of a high-ranking English scientist, Thomas Willis (1621-1675), in which he earnestly considered the question of whether the vital spirit should be compared with wine spirits or hartshorn oil.

VIII

The great sensation caused by Harvey's discovery of the mechanical nature of the circulation of the blood was basically due to the aforementioned characteristic of man to swing from one extreme to another in his theories. Prior to Harvey's demonstration it was held generally that what are today designated as natural biological processes were accomplished by a strange commingling of supernatural and natural forces, e. g., the vital spirit which caused the blood to move.

Such a conception of nature did not encourage laboratory study as a means of solving problems. Pure speculation was the only course open in the attempt to solve natural problems. This left scientists in a peculiar defeatist rage which arose as a result of the baffling nature

of the assumed mechanism of natural phenomena. It was as if man stood forcibly restrained, yet the while clasping and unclasping his hands and wishing mightily to get at the problems of natural history and solve them. He unconsciously blamed the Supreme Intelligence for conducting such phenomena as the circulation of the blood in a manner which man with his natural limitations had not the equipment to unravel.

Then came Harvey and his proof that a purely mechanical process was the cause of the circulation. The restraining leash had been cut with one stroke, and almost with a bound scientists fell to an analysis of biological processes by applying the same laws that were recognized in the inorganic world. And many of the processes which had before been hopeless mysteries began to be explained as lucidly as the circulation of the blood.

In his exuberance the scientist quite largely forgot the Supreme Intelligence and swung to the extreme view that laws of chemistry and physics were responsible not only for all present-day biological processes but also for the origin of life itself. Many workers, through a process of reasoning difficult to understand, decided that there was no need for a Supreme Intelligence at all.

IX

It was in the first half of the nineteenth century that, through the efforts of three men, the German biologist Mayer, the English physicist Joule, and the German physicist and biologist Helmholtz, the principle of the conservation of energy was demonstrated. The establishment of this principle gave a powerful stimulus to the experimental study of living organisms. Immediate steps

were taken to apply the new idea to as many life phenomena as possible.

This principle was extremely intriguing in that it placed all natural phenomena, both animate and inanimate, in one single simple and clear causal connection, and offered the hope of being able to bring all manifestations of life under the same simple explanatory principles that physics and chemistry had already adopted. Evidence that this principle was in harmony with at least many of the facts is found in the brilliant achievements in the field of experimental physiology which occurred in the following decades.

X

One of the peculiar aspects of this successful application of the principles of physics and chemistry to a study of biological phenomena is the mental, or shall I say spiritual, effect that it had upon the investigators in general. When man's speculative thoughts continuously ran in the groove of assumption of a mysterious, supernatural, and inexplainable manifestation through natural processes, he was forced, often against his will, continually to admit that all these processes were a display of the supernatural power of some Higher Intelligence which he was loath to recognize for various reasons. But when it became apparent that natural phenomena were, after all, largely understandable because they occurred through the operation of physicochemical laws, a spiritual reaction set in which was manifested by man's assumption that, after all, no Supreme Intelligence was concerned with or necessary in the operation of these processes. The peculiarity of this conclusion lies in the fact that as long as the process was considered as being carried on in

some haphazard way impossible to understand, it was assumed to be sustained by God, but as soon as it appeared that it was due to regular and lawful processes, then it was assumed that God was not in it.

This strange conclusion did not die with the nineteenth century. We find plenty of scientists today who claim to believe that natural processes are self-originating and self-sustaining. The special creationist feels that it is entirely within the realm of common sense to assume that since natural "laws" cannot arise spontaneously, nor maintain *themselves,* and since they do behave in very regular and orderly fashion, so much the more is there reason for concluding that these processes had their origin in a Creator and exist moment by moment because they are a manifestation of His continuously applied power.

But strange as it may appear, the historical fact stands that man has concluded that blood which circulated because of a vital spirit within it, was operated by a Supreme Intelligence, but blood that circulated in a purely "mechanical" manner depended in no way upon such an Intelligence. The mind of man did not seem generally capable of grasping the idea that a Supreme Intelligence might just as well operate His creation through understandable "physicochemical laws" as by laws which man could not understand.

The special creationist holds that a Power which would make a reasonable man would be expected to place him in a world which was shaped to carry on in ways which that man could, with proper application, be capable of understanding. However, it stands as a known fact that successful application of physicochemical laws to a study of biological phenomena was taken by scientists quite generally as proof that not only was the speculative

system of the schoolmen all wrong, but, remarkable to relate, so was the theory of special creation! It would be just as sensible to say that because icebergs formed in the arctic, water tumbled over Niagara Falls!

Such a conclusion is understandable when we remember that science had been in bondage for centuries under the heavy hand of authority of the church. All during that time the statements of the Bible were much in the public eye and thrust down the throats of scientists in order to prove such "facts" as the earth standing at the center of the solar system. This coercion with regard to acceptance of Biblical statements from the narrow point of view of the scholastics put man on the defensive *against* the Bible. To scientists quite generally the Scriptures symbolized all that enslaving bondage could do to circumvent truth. The pity is that these men did not read it for themselves and see that it was not the Bible but the schoolmen who propounded such inaccurate conclusions.

Any philosopher who believed in a personal God and a personal devil would say that the latter had accomplished a master stroke in so poisoning the minds of men against the teachings of the Bible through the activities of the schoolmen as to cause man to conceive of the Scriptures as setting forth only that which was untrue. He would say that that devil had so manipulated events as to cause the very agency that had preserved the Bible through the Dark Ages to turn the scientists, those men who would naturally often be first in the verification of the truth of Biblical statements, against the Bible. The student of facts today will recognize that much of the antipathy of evolutionists for the theory of special creation is clearly traceable to the *unpleasant* experience which

scientists suffered at the hands of medieval men who *claimed* to be expositors of the theory of special creation. The sooner evolutionists learn that special creationists abhor the conclusions of the schoolmen as thoroughly as do evolutionists, the sooner will they be able to recognize that evolutionists and creationists stand on common ground and that the adherents of neither theory have any particular corner on the ignorance, dogmatism, or prejudice of our day.

XI

We have referred to the inaccuracy of maintaining that the remarkable progress in biological sciences which began in the seventeenth century and which developed with increasing tempo through the eighteenth and the first half of the nineteenth century, was due to a turning away from the theory of special creation. We have called attention in a general way to the true situation, revealed by a study of Bible statement and of the doctrines of the schoolmen, in which the enslaving views of the scholastics are found to be in disharmony with Bible statement. The size of this book precludes any illustration of this fact other than its exposition in the theory for the circulation of the blood. The reader may wish to seek additional confirmation in historical records of the views of the schoolmen and by a comparison of these with the actual Biblical statements. Such a study reveals that the stagnation of science during the Dark Ages was *not* due to an attempt to explain nature from the point of view of special creation. The liberation from this stagnation resulted from a recognition on the part of scientists, belated as it was, of the mechanism by which natural biological phenomena *are* carried on. We will leave a discussion of the compati-

bility of the theory of special creation with physicochemical laws to the next chapter.

XII

In preceding paragraphs we have considered the schoolmen as philosophers who claimed to hold to the theory of special creation. In doing this we must remind ourselves that in actual fact these men would be more exactly pigeonholed if we were to place them with the evolutionists. In truth, evolutionists of our day list the two schoolmen, Thomas Aquinas and Augustine, with those who held to the theory of evolution. However, due to their defense of the truth of Biblical statements they with their colleagues are commonly grouped with those who held to the theory of special creation, and any impossibly narrow-minded positions which they or their fellow scholastics propounded were laid at the door of the theory of special creation.

In searching ancient records for the first notation of man's conception of the principle of organic evolution, we find that it had its debut among the writings of the Grecian naturalists, and Thales (650-580 B. C.?) and his disciple Anaximander (611-546 B. C.?) share the "credit" of first giving expression to it. Some authors hold it to be misleading to speak of the Greeks as evolutionists, because they were merely pagan speculators about origins. I do not wish to enter into any argument here with regard to just what slant of opinion is necessary in order to be an evolutionist. But for practical purposes it seems to me that if a man holds the opinion that humans first existed in water as fish, and that these fish later cast off their skins, went up on dry land and then became men,

he may justly be called an evolutionist. This theory of man's origin was conceived by Anaximander. Of course the idea of evolution never took hold of the imagination of man until many centuries later. Those of the schoolmen who were evolutionists placed so much emphasis upon the theistic angle of it that its real import was generally overlooked. Some of the independent scientists who received the baton of science from the schoolmen occasionally took time to go on excursions into the subject of origins, but here also the principle did not catch the general fancy.

XIII

It may seem strange that, and, on the surface, difficult to understand why, the theory of organic evolution had to be brewing in more or less obscurity for twenty-four centuries before it came to the front with a rush and captivated the fancy of layman and scientist in a few years of time. The explanation must be found largely in the times, certainly not in the man who put the principle before the world. As a scientist, Charles Darwin (1809-1882) had but a dilettante conception of nature. After all the glorification of the man that an idolizing public, which finally caused him to be buried close to Newton in Westminster Abbey, could heap upon him had finally subsided, it came clearly into sight that his work had a vague starting point, his material was uncritical, his arguments were weak and based on loose assumptions, his belief in the power of chance was unjustified, and his conception of no finality in nature was definitely wrong. From our point in history we find that long ago his theory of evolution was rejected in every vital point by subsequent research of *evolutionists*. Yet Darwin and his publicity agent in the person of

Thomas Huxley (1825-1895) were such good salesmen that the world of science is still to a large extent sold on the principle.

In answer to the question, "Why was the principle of evolution so generally received in such a short time?" the evolutionist would answer, "Because it was the expression of a true principle in nature." The special creationist would say it succeeded because scientists *thought* it was the expression of a true principle, but actually, reason for the warmth of its reception lay in the build-up for it that had unconsciously been made through the oppression of science by narrow-minded individuals, accomplished through the bondage of authority during the Dark Ages. Man was looking for a way of escape and Darwin pointed toward an attractive exit. The scientist likes to think that he is a mere chronicler of facts in the natural world, but his humanity comes repeatedly to the fore, and too frequently wishful thinking largely slants the ground in the direction that his theories will eventually take.

At the time that Darwin's *Origin of Species* was published, man had become very painfully aware that he had been in spiritual, intellectual, and political bondage for centuries. From its first appearance, Darwin's theory was an obvious ally to liberalism. It elevated the doctrine of free competition, and its strongly worded aggressive attack against the doctrine of creation could be used to counteract theological hindrance to the progress of scientific knowledge. As seen through Darwin's optimistic eyes, progress was the law governing nature and human life. Scientists of Darwin's day and scientists of our day are still thirsting for progress. They determined that if evolution is the manner in which this is to be gained in

biological problems, then evolution it should be. Man wanted to be out from under the hand of oppression in every detail. Darwin pointed the way. Man obeyed and escaped the strangle hold of scholasticism. Much credit is due Darwin for breaking this hold of the schoolmen on science. But the tragedy for science consisted in his substitution of an idea which was just as unsound as was the one he showed to be false. His recognition of change was an extremely fertile one and has led to remarkable scientific achievement since his time. However, his conception of variation without limitation has done untold damage in scientific circles.

In the days of Darwin there was no one to champion the cause of special creation. Owen, Agassiz, and Wilberforce attempted to criticize Darwinism, but saturated as they were with the opinions of the medieval biologists, their objections offered but feeble resistance to the sweep of the popular idea of unlimited development.

XIV

Thus we observe that progress in scientific investigation had a new birth as soon as the schoolmen's conception of the theory of special creation was rejected and the principle of the conservation of energy was applied to biological research. A second birth of increased success in the attack of biological problems occurred when Darwin completely broke the hold of the schoolmen and sold the conception of change and development in nature.

At this point I wish again to call attention to the fact that this scientific progress cannot truthfully be said to have occurred *because* the pure theory of special creation was rejected. The facts are that seldom in the history

of true science have the principles of the theory of special creation as set forth in the Bible been knowingly applied to research. They have in truth been applied repeatedly, but the worker was usually not aware that the course of his study and the results of his research were directed and predicted by the theory of special creation. That this is true will become more obvious to the reader as he peruses succeeding chapters. That definite progress in biological investigation began when physicochemical laws were recognized and when developmental change was admitted, is obvious. Whether this progress was due to a conception of evolution or in spite of it will be discussed later.

★ ★ ★ CHAPTER FOUR ★ ★ ★

The Scientific Method

I

WHEN I WAS A YOUNGSTER growing up on a farm it at times came my turn to collect the hens' eggs for the day. While doing this I learned at least one lesson—that it was useless to hunt eggs up in the attic, or out in the garden, or down the well, or even in the rabbit's nest in the orchard. The place to look for hens' eggs was in the vicinity where hens were or had been. The nearer I came to the nests the nearer I came to discovering eggs. When I found the hens' nests I found hens' eggs.

At first thought it may seem a far cry from hens' eggs to the rapid progress in biological research which started as soon as man began to investigate natural phenomena in the light of physicochemical laws, or to the rebirth in progress which occurred as soon as developmental forces were recognized in nature. But the explanation for this progress lies in the fact that, at last, after centuries of misapplied endeavor in searching for explanations among the writings of antiquated authority, scientists began to study nature firsthand. They began to study nature from a point of view that appears to have been very close to the right one. They were finally looking for hens' eggs somewhere in the vicinity of hens' nests, and at times they doubtless looked directly into the nests. Even if in the

vicinity only, their work would be much more successful than before. A near miss in biological research is nearer the truth than a wide miss. A very difficult part of biological research is to discover whether the current explanation of some natural phenomenon is the true one or merely somewhere near the truth. Some may say that progress did not come until the theory of special creation was rejected. It would be far more accurate to say that progress did not come until scientists began to inquire of nature in a language she understood. That language appeared to be the speech of physicochemical laws.

II

Strange as it may seem, yet not without reason, special creationists often seem to have as much of an aversion to the idea of life processes being carried on by physicochemical forces as the evolutionists have to the suggestion that supernatural forces may have something to do in the accomplishment of natural phenomena. The latter aversion is easy to understand after one becomes acquainted with the experience of scientists during unproductive medieval times when all processes were thought to be achieved by a supernatural force acting in some nonunderstandable way. The former aversion is also understood at least in part when we recall the swing which scientists made to the other extreme in their reaction from scholasticism. For a period of time biological scientists largely accepted a purely mechanical explanation of all life processes, even considering that a Supreme Intelligence was not necessary in the picture. The psychological effect of this upon the special creationist was to cause him to regard with suspicion any suggestion which led to the

conclusion that purely mechanical forces were the operative agents from the beginning until his time. If the truth is to be arrived at by either school, facts in the natural world will have to be scrutinized closely and candidly.

Perhaps I should explain what I mean by the word "candidly." A candid scrutiny would be one which was free from *undue* bias. To the special creationist this would mean that his approach to biological research must be with impartiality in every point except with regard to those basic principles laid down in the Bible. These principles, in his mind, are the guideposts, or shall we say, the limiting factors set by the omniscient Creator of a reasonable man whom He placed in an understandable world. The Bible contains only those bare facts which are necessary to direct the path that research must take if truth is to be revealed. By adherence to these guiding principles the researcher will not waste long years of his life trying to find evidence or proof for something which the Bible says does not exist. The special creationist, from his point of view, maintains very earnestly that a scientist cannot be sensible and ignore the guiding principles given to him by his Creator.

In the mind of the evolutionist a candid scrutiny means something quite different. He would have to use another adjective than "candid," because *"candid"* means free from *undue* bias, and in his mind research, to be scientific, must be conducted *without* bias. Preconceived notions such as those pertaining to a Creator and a creation must be laid aside and nature approached with a blank mind as regards partiality even concerning origins. The evolutionary scientist generally holds that he will believe nothing that cannot be demonstrated in the lab-

oratory. The special creationist argues to the contrary that the evolutionist does not abide by this criterion but persists in believing in that which cannot be demonstrated in the laboratory, e. g., evolution, in the same sense that one kind of animal becomes another kind. Nevertheless the evolutionist still claims to hold that laboratory demonstration of a truth is necessary for its establishment. Therefore, in view of the impossibility of proving in the laboratory that a Creator formed the world six thousand years ago, he says that he cannot accept the idea.

III

This "scientific method," an admirable and absolutely essential tool in the establishment of many truths, is employed by the special creationist except as conditioned by those few basic principles set forth in the Bible. It is entirely reasonable to hold that the scientific method, i. e., laboratory observation and demonstration, has its limitations. For example, suppose that the ancestors of our modern organic forms *were* created. How could such a fact ever be discovered or demonstrated by laboratory experimentation? Experimentation is therefore inadequate in certain lines.

Here a very queer and unjustifiably arbitrary turn of mind is observed which leads the evolutionist to maintain that laboratory demonstration is the only source of truth in our world. In order to build all his philosophy upon such a platform, he must assume that man is completely self-sufficient. He must assume that he is just as wise as an omniscient Creator would be. Certainly there is nothing in the history of man to justify such a conclusion. It is not in harmony with facts and therefore not sensible.

When origin of inorganic materials and natural forces is considered, it is absolutely essential to postulate a supernatural force in our universe.

The rapidly increasing number of scientists who in recent years are turning from a belief in a purely mechanical universe to the opinion that a Supreme Intelligence is responsible for all these basic materials and forces, is testimony that man was a bit too hasty in concluding that the scientific method was adequate for the discovery of all truth. In the light of its actual range of use it must be recognized as being of limited application. The special creationist holds that the only thing needed to supplement it is the small body of basic facts and principles listed in the Bible.

The real reason for the adoption of the "scientific method" by evolutionists possibly may be found in the force-feeding method of administration of Biblical statements during the Dark Ages. Scientists came to adopt the platform of the necessity of laboratory proof as a means of self-defense against the theologians who were obnoxiously militant in scientific fields. If the Bible were to be accepted as a guidebook, the scientists feared they would always remain throttled by the church. Then the discovery of the universal application of physicochemical laws in biological processes gave the final encouragement needed to decide upon the complete adequacy of laboratory demonstration.

The adoption of this method was diplomatic in that it bowed troublesome theologians out of the picture and also any moral or spiritual obligations which would be attendant upon an acceptance of Bible veracity. This is a bald statement to make; nevertheless I believe the latter reasons were just as weighty in the construction of the

present platform of scientific method as was the conviction that physicochemical forces were the only forces involved. Wishful thinking and natural inclination are powerful factors which influence even the decisions of scientists.

IV

Certain facts which bear directly on this problem are recognized by scientists. We know of no way in which natural forces can arise spontaneously from nothing. We have no natural explanation of how such forces as gravity are maintained. We have no natural explanation of how our present forces operate so harmoniously together—chance could not produce this co-ordination. We know of no natural way that all chemical elements could arise spontaneously from nothing—material must have had an origin at some time. It is generally recognized that spontaneous generation of living forms does not occur. It has not been demonstrated that one kind of organism has changed or is changing into another kind of organism.

In view of these facts, the special creationist does not believe that the evolutionist is justified in maintaining that we can recognize as truth only that which can be demonstrated in the laboratory. To him, a man who holds to this opinion is merely whittling the universe down to his small size. Everything which he cannot study in the laboratory he turns his back upon and ignores, or shall we say, he waves a magician's wand over it and says, "Presto! These things do not exist!" The remarkable thing is that his set of mind has such a powerful influence over his observational powers that he apparently ceases to notice that his scientific method is woefully inadequate in several directions.

Suppose that time will continue to reveal more and more clearly that there are real things that will not submit to laboratory demonstration. The evolutionist assumes that this present world has erected itself with the natural forces now in operation. In his mind it has lifted itself by its own bootstraps. That is merely his opinion. Other points of view are possible. For example, it is possible that a Supreme Intelligence created this earth and now keeps it going by the application of His power through natural laws. Because of the facts mentioned above, this latter view does not appear at all nonsensical. Imagine how ridiculous the evolutionist would feel to learn that he had been afflicted by a very bad case of shortsightedness and was actually viewing but an extremely small cycle in the history of the world. His scientific method would take care of present processes, but it most certainly would be inadequate when projected backward to the beginning or even when projected forward in an endeavor to prophesy the future end of living things.

If the evolutionist would not attempt to compass beginnings and endings along with present processes with his scientific method, little fault could be found in his procedure. He and the special creationist would, and do, work side by side harmoniously in the laboratory endeavoring to unravel the operation of natural processes. Together they crusade against ignorance and superstition through the employment of the scientific method. Together they braved the frown of the schoolman in dispersing the superstitions which flourished under his reign. Together they weathered the browbeating attack of his *"Maestro dixit!"* (literally, "The master has spoken!") when they asked for a justification of his opinion, and then went bravely forth and shared the vulgar task of

opening the horse's mouth to discover how many teeth it actually had. The evolutionist and the special creationist are companions in research, but when the former begins to assert that the scientific method is ample enough to also explain beginnings, the latter is forced to disagree. In the face of facts he must recognize the inadequacy of this method and build his philosophy accordingly.

V

We have referred to the fact that in building his philosophy the special creationist begins with the few basic facts regarding biological beginnings and continuance which are found in the Bible. However, because of the paucity of information from this source he is largely dependent upon facts in the natural world for the superstructure of his philosophy. When the interpretation of material from the natural world is truthful and when the phenomenon is mentioned in the Bible, he finds harmony between it and the Bible record.

His problem is to decide what method should be employed in interpreting nature. According to his philosophy the earth was completely fitted as a home for man. Then the man was formed and placed in this previously prepared environment. He holds that natural science was one of his principal fields of study. In a way, man's study of nature was somewhat of a game. The earth was fully equipped with its forces and materials and organic forms; then when man appeared he was told only what was necessary to direct his study along lines that would lead to discovery. The Creator established the processes, and the game was for man to attempt to discover how the processes were carried on. As the astrono-

mer Kepler expressed it, man was to think the thoughts of God after Him.

The belief held during the Dark Ages that God was some sort of magician who performed these processes in a supernatural and mysterious way, caused man to view Him with a species of gaping wonder. But when after the close of medieval times it was found that it was through laws of physics and chemistry that these processes were being operated and that these forces were largely understandable by man, the wisdom and provident care of God became recognizable and gaping wonder gave place to intelligent delight, and superstitious obeisance gave way to rational worship. Upon some, unfortunately, the discovery of understandable methods in the carrying on of natural processes had the same effect that the discovery of a magician's method has which results in a cessation of faith in and wonder concerning the performer. This is unfortunate, because an honest and fruitful worker is entitled to something more than willful disregard.

VI

When all the theological formulae of the scholastics and the accouterments which were forged by superstition have been brushed aside from the face of the Bible record, the special creationist finds the following facts revealed concerning present-day biological processes: All things live and move and have their being in God; [1] all things consist by Him; [2] He constantly upholds all things; [3] He preserves them all; [4] because He is strong in power not one fails; [5] He makes the grass to grow; [6] He gives food

[1] Acts 17:28.
[2] Colossians 1:17.
[3] Hebrews 1:3.
[4] Nehemiah 9:6.
[5] Isaiah 40:26.
[6] Psalms 147:8.

to beasts and birds;[7] He causes the winds to blow and the waters to flow.[8] Many verses in the Bible express these same ideas.

But the reader must observe that aside from learning from these references that God is the great Maintainer, he is told nothing about *how* God accomplishes this. He does not know from the text whether God achieves His maintenance through mysterious, supernatural methods or through the more understandable ways of physicochemical laws. This method of operation is left for man to discover. Success in biological research since medieval times has occurred, not because the Bible was ignored, nor because evolution was substituted for special creation, but because man had apparently discovered God's method of maintaining living processes. Any worker, regardless of how irreverent he might be, could anticipate success if he looked for hens' eggs in hens' nests.

VII

Although some special creationists have looked askance at the idea of mechanical processes accomplishing the phenomena of life, still it appears difficult to justify such an attitude. After all, why is not a mechanical process just as much a manifestation of a Creator's power as would be some nonmechanical exhibition of force?

The evolutionist has cast out of his consideration and apparently forgets all forces which may exist but which cannot be examined in the laboratory. The special creationist, on the other hand, holds that physicochemical forces are apparently largely responsible for the opera-

[7]Psalms 104:21, 27, 28; 147:9.
[8]Psalms 147:18.

tion of present-day life processes, but he does not believe that these are the only forms of force in the universe. In his opinion, the Maintainer apparently chooses to accomplish natural phenomena through the operation of physicochemical forces, but this Maintainer has the power at any moment to speed up or slow down these forces in unnatural ways or even to suspend any one at any time.

The special creationist holds that even though we do not have the capacity to understand God, it may be possible, because of the form of expression of His power in natural processes, that we will be able to understand how the blood circulates or how a flower bud opens. It is clearly manifest that physicochemical forces at least are largely responsible for living phenomena. The evolutionist and the creationist find it necessary to recognize this fact.

Continued research of the near future may clarify obscure points which now are difficult to explain from the viewpoint that natural forces only are operating. It seems that in some organic processes, such as long-time, unclogged movement of water upward through the xylem vessels of woody plants; the unexplainably rapid gaseous exchange in the lungs; or the clearly defined developmental paths followed by each animal in growing to adulthood from the fertilized egg, the presence of "life" only can add that final small bit to the process which must be added to complement physicochemical processes and achieve successful completion of the general result. Already physical or chemical processes are beginning to appear sufficiently adequate for even these obscure processes. For example, enzyme action as a catalyzer is indicated as the chemical explanation for the rapid gaseous exchange referred to above.

VIII

The evolutionist and the creationist stand agreed that the scientific method is the only practical method by which to solve the innumerable biological phenomena. There is no reason why there should be any difference in the quality of their work unless the sense of reverence and accountability within the latter which arises as he endeavors to solve the riddles of nature, considering the while that he is thinking the thoughts of God after Him, causes him to labor with a greater earnestness and integrity as one accountable not only to his fellow men but also to God. Pasteur said, "I pray as I work in my laboratory." Similar sincerity in any research worker should make it possible for him, like Pasteur, to enjoy the satisfaction of highest achievement in the discovery of truth.

★ ★ ★ CHAPTER FIVE ★ ★ ★

The Physical Basis of Life

I

THOMAS HUXLEY in 1868 defined protoplasm as "the physical basis of life," and he has done a better job than most who have attempted to describe it in so few words. Before taking up a study of the subject of change in nature, it may be worth while to give attention first to a superficial consideration of this important substance in which the phenomena of life are enacted. In the main, this chapter is a brief continuation of the consideration of the operation of physical and chemical laws in biological processes.

II

Protoplasm is a *living system* of components which individually to all appearances are nonliving—a system composed of all the substances that are participating in essential protoplasmic reactions at a given moment. We sometimes say that all protoplasm, whether in plant or in animal cells, is the same. This statement is true only in a very broad way, and is made with the intention of emphasizing the fundamental similarity of the life complex in all living organisms. Life, whether that of plant or animal, is intimately associated with organic substances. About ninety-five per cent of its dry weight consists of

such organic compounds as amino acids, purines, albumins, sugars, nucleoproteins, nucleic acids, globulin, lipoprotein, fat, phytosterin, and phosphatides. This leaves but 5 per cent of inorganic material.[1] The amount of water in protoplasm varies greatly under different conditions, but usually in active forms it is present in large proportions. It varies from about 80 per cent in our muscles to as much as 99 per cent in jellyfish. That such a small proportion of protoplasm can manage so much water and keep it looking like a jellyfish and behaving as jellyfish should, is nothing short of remarkable.

We commonly speak of protoplasm in the singular number, but it would be more accurate to say protoplasms, because not only is it different in every organism, but it is also different in each kind of tissue in each kind of organism. Furthermore, the chemical setup in any one cell varies from one physiological state to another. Although protoplasm is made up of the complex chemical substances listed above, still it is not a mere mixture of these materials. It is an intricately organized colloidal system, and only by virtue of this specific physicochemical organization does it serve as the material substratum for the peculiar and orderly activities characterizing the organism. These activities include synthetic metabolism, irritability, reproduction, and adaptive response.[2] Living protoplasm should always be thought of as a system in dynamic equilibrium. It is continuously maintaining itself through a balance of constructive and destructive processes. In all chemical analyses of protoplasm the most significant characteristic of it is not revealed, namely, its peculiar organization. According to Lillie, "this building

[1]William Seifriz, *Protoplasm*, p. 527.
[2]L. W. Sharp, *Introduction to Cytology*, p. 25.

up . . . of a complex system . . . out of relatively simple nonspecific materials taken from the surroundings (food, water, salts) is the fundamental general peculiarity which distinguishes living organisms from nonliving systems." [3]

Protoplasm is a translucent, grayish, and slimy substance, usually capable of flowing, though often of moderately high viscosity even when flowing. When viewed under ordinary magnifications it appears as a colorless, optically homogeneous fluid, called hyaloplasm, in which there are usually embedded granules and globules of varying size, shape, and number. It possesses both viscosity and elasticity. In general, it seems that animal protoplasm is on the average more viscous than that of plants.

Wherever it appears, protoplasm is commonly found contained in units called cells. The formed spherical body near the center of the mass is designated as the nucleus, while the remainder of the protoplasm of the cell which lies around the nucleus is termed the cytosome and its substance is called cytoplasm. In order for a cell to give evidences of being alive for any length of time it must have, or be under the control of, a nucleus. Cells deprived of their nuclei may live for considerable periods of time but eventually die, owing to the lack of control of their general metabolism which appears to be centered in the nucleus.

III

Experiments have been made in order to determine whether the macroscopic and microscopic inclusions in the cytoplasm, such as fat and oil droplets, minute vacuoles, granules, and chondriosomes, must be present if it

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[3] R. S. Lillie, *Protoplasmic Action and Nervous Action*, p. 4.

is to continue to carry on its characteristic activities. The results show that these inclusions are not immediately necessary to the life of the cell. Hyaline pseudopodia cut from granular amoebae are irritable and move in a typical amoeboid manner. Centrifuged sea-urchin eggs can be cut in two portions, one with all the visible inclusions except oil globules and the other with none, after which both portions can be inseminated and undergo cleavage.[4] This means that the visible inclusions, even though a part of the living system in the sense that they are active in protoplasmic reactions, are not an indispensable part of protoplasm. According to Wilson, "it is in the apparently structureless hyaloplasm that the real problem of cytoplasmic organization lies." [5]

Seifriz says:

> "Lying beyond the visible structure of protoplasm is another of a quite different character to which many of the more fundamental properties of living matter owe their existence. Of the nature of this 'ultimate' structure we can only conjecture, though our speculations have some foundation." [6]

IV

When the clear and apparently specifically essential portion of protoplasm is viewed through the ultramicroscope, it presents an appearance which may be roughly compared with that of floating dust in a darkened room when lighted with a beam of light from one side. In the case of the dust, we actually see the particles illuminated from the side, but in studying protoplasm through the ultramicroscope the visible bright dots of irregular size

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[4] L. W. Sharp, *Introduction to Cytology*, p. 32.

[5] E. B. Wilson, "The Physical Basis of Life," *Science*, March 9, 1923, Vol. 57, p. 283.

[6] William Seifriz, *Protoplasm*, p. 4.

which are scattered over a black, homogeneous background are not the actual particles which are too small to be seen even under this most powerful magnification, but rather are due to scattered beams of light which they have diffracted.

Here we are actually looking at the physical basis of life. The homogeneous background which compares with the air in the darkened room is largely water. The minute particles whose whereabouts are made known by the rays of light they scatter are apparently clusters of molecules of the organic substances listed in the second paragraph of this chapter. The diversity of activity possible in the most highly complex living body arises in this basic material. Whether the organism is a man or an amoeba, this essential substance is the incomprehensibly complex laboratory in which all life processes are carried on.

Life resides in this protoplasm and does not cease under natural conditions unless some physical or chemical disorganization occurs in the essential substance. We can cause the death of an amoeba in any of many ways. If it is made too hot, its protoplasm is coagulated and it dies. If certain chemicals are brought into contact with it, the same thing occurs. If other chemicals disturb its organization in other ways, it dies. If it dries out, it either dies or escapes death by forming a cyst wall about itself and in that way conserves its vital water supply. If oxygen is absent, life soon ceases. If a water-immersed cell is caught beneath some object, slight pressure causes it to burst, its protoplasm mixes with the water, and as it does so its life phenomena cease.

In complex bodies of higher animals, even though the animal be decapitated, death comes gradually to the cells. Some, such as those of nerve tissue, may die in a

short time. Other cells, such as those in muscle tissue, may continue to live for hours or even days. Death finally occurs through an accumulation of toxic wastes, absence of sufficient oxygen, etc., all of which bring about the requisite disorganization of that finely balanced and extremely complex physicochemical state whose organization must be present if the characteristics of life are to be manifested.

V

The phenomena of life cease gradually in cells which have been taken from the body of a complex animal. When a local butcher goes out into the country, buys a pig, fires a bullet into its brain, then hangs the carcass up and proceeds to dress it, we commonly consider that the life of that animal has ceased. The amazing fact is that days later, body cells here and there in the flesh of the dead animal will be found to be still alive.

> "Strangeways, in order to illustrate to his students that there are two types of death, that of the body as a whole and of the individual cell, was wont to purchase fresh sausage at the market and from its ground meat make a number of cultures of which one or two always formed thriving colonies of cells. In the Carrel laboratories, growth in culture has been obtained from fragments of tissue kept for five or six days in cold storage." [7]

Under such conditions where the cells are protected from drying, disorganization of protoplasm apparently occurs very slowly.

VI

That life is not merely dependent upon any fortuitous mixture of the organic compounds listed above, but rather is definitely dependent upon a certain organization of

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[7] *Ibid.*, p. 83.

these vital substances, is made clear by a simple experiment. A. R. Moore found that if the plasmodium of slime molds is allowed to flow through a sieve, even though it be a very fine one, it will accomplish the feat and apparently be unharmed, but if it be *forced* through even a moderately fine sieve it will be found on the other side apparently unchanged, and obviously with the same chemical elements, but dead.[8] The person who can explain the results of this simple experiment will be able to explain the difference between a living and a dead organism. If the organization of protoplasm is so delicate that forcing it through a moderately fine sieve will kill it, how can any physiological chemist look with much hope of solution upon the problem of synthesizing living protoplasm from dead materials in the laboratory?

Seifriz believes that such data as these regarding the killing of protoplasm by pushing it through filters are proof that in its ultimate structure the living part of protoplasm consists of complex organic compounds whose molecules are in the form of long, slender fibers. The thought is that, when allowed to flow, these delicate molecules pass endwise through the holes in the very fine sieve, and because they keep their peculiar organization the mass is alive on the other side, but when pushed through, these long fibers become broken and disorganized and the protoplasmic mass is no longer alive. This explanation seems plausible.

VII

We enjoy studying the amoeba under the microscope because we think of it as being just about as simple an

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[8] A. R. Moore, "On the Cytoplasmic Framework of the Plasmodium," *Science Reports*, Tohoku Imperial University, Japan, 4th series, Vol. 8, pp. 189-191.

expression of protoplasmic life as we can find. But even an amoeba is far from a *simple* microscopic glob of living substance. It is just as complex a particle as any that can be found in the body of a highly organized metazoan such as man, and much more independent.

Mechanistic scientists conceive of life, at its first appearance on this earth, as being in some "simple" one-celled form "like an amoeba." But the more minutely the amoeba is studied, the more complex it appears. So finely are its components balanced that they are easily disrupted and death ensues. When they are once disrupted, no one has ever been able to put them back as they were so that life will again appear. The prognosis is that no one ever will. "All the king's horses and all the king's men" cannot restore that vital, dynamic balance among the organic substances even when the requisite materials are right at hand and merely on the other side of a sieve from where they were living a moment before.

Seifriz reports that our tiny, one-celled glob, the amoeba, when tightly held, will act very much like some highly complex organism. If thrust through with a micro-needle it commonly hurriedly leaves, pinching off that part of its mass which is held by the needle. In Seifriz' words, "We shall leave for the philosopher to decide the difference between a fox chewing off one of his legs when caught in a trap and an amoeba pinching off part of his body when caught by a needle." [9]

The differences between a nonliving mass of organic substances and a living mass are so great that one can scarcely appear sensible and hold to the opinion that a fortuitous meeting of nonliving substances could result in

[9] William Seifriz, *Protoplasm,* p. 58.

the advent of life on our earth. Add to that the conception that a continuation of these chance happenings for one thousand million years have resulted in a highly intelligent man, and we never cease to marvel at the lengths to which even a scientist's imagination can, at times, lead him. We ask ourselves, "Where is this individual who claims to believe only that which he can demonstrate in the laboratory?"

VIII

In this consideration of the physical basis of life it may be profitable, and develop our thinking on this subject a little further, to consider the three possible theories with regard to what in protoplasm is living or alive. Seifriz [10] considers these theories in his chapter on "The Origin of Living Matter." I will follow his material quite closely.

The controversy over this subject has settled down to two possibilities, and, of course, always there is a third. These are as follows: (*a*) The presence of some one ultimate vital substance, (*b*) a mixture of substances the individual components of which taken alone are nonliving but combined constitute a living substance, and (*c*) the constituents are nonliving, while the life force is extramundane.

IX

With regard to the first possibility, early biologists, influenced by the vitalism of their time, recognized special vital bodies in protoplasm which gave to it the properties of life. Buffon and Verworn conceived of large living

[10] *Ibid.*, pp. 522-537.

molecules which they called "biogens." Spencer postulated "physiological units"; and Altman, "bioblasts." Somewhat similar to these vital bodies, however, with particular reference to hereditary units, are the "gemmules" of Darwin, the "pangens" of de Vries, the "plastidules" of Haeckel, and the "biophores" of Weismann. In the mind of these men the distinction between living and nonliving matter would lie in the possession of special vital bodies by the living substance. Such speculative ideas are no longer seriously considered, although they are not far removed from many modern thoughts. Numerous physiologists have expressed the belief that a definite substance or group of substances represents the ultimate living material. Leathes and also Pauli lay emphasis upon proteins as such possible substance in the form of a protein complex, while Duclaux and also Berzelius directed attention to enzymes and consider the possibility of life itself being a play of organic catalysts.

X

Opposed to the school that postulates a highly complex substance peculiar to living matter is that school which regards all the constituents of protoplasm as lifeless when considered individually. While this may be true, it is still possible to distinguish between strictly nutritive matter in the cell, e. g., fat droplets, and the active kinetic material. Even though protoplasm has its fuel, and its regulators such as water, yet it does appear to be true that it contains a great number and variety of proteinlike substances which seem to be peculiar to it. Living matter is without question a well-organized system. In addition to the probable possession of certain proteinaceous sub-

stances peculiar to it, the only material difference between it and nonliving matter is the great complexity of its systems as a whole.

Back in the days when a *spiritus vitae* was presumed to give to plants and animals the power to synthesize organic substances, it was supposed that such synthesis could not be duplicated in the laboratory. It was assumed that only God could make organic compounds. Then Wöhler built urea in his laboratory in 1828. From this a reaction set in which, shortly after the middle of the last century, led to the expression by Berthelot that "the objective of our science is to banish 'Life' from the theories of organic chemistry." This was the inauguration of the revolt against vitalism in chemistry.

Swayed by the considerable success of chemists in the synthesis of organic compounds, many of the younger biologists fell into line with the mechanists among chemists and boasted of the production of living matter in the near future. J. Loeb expressed it as his opinion that "something like living matter" would be compounded in the laboratory within a very few years, and recent utterances to the effect that, having "gone a long way toward understanding the composition of an amoeba, it will not be fifty years before we can build a single-celled organism like the amoeba," express a hopefulness that experience does not support. As expressed by Seifriz, "The statement [about understanding the composition of an amoeba] could be challenged," and we yet await any announcement concerning the laboratory construction of the one-celled organism. The organization which synthesizes such substances as urea is apparently something infinitely more complex in structure than the compounds it builds.

XI

In the third theory with regard to which part of protoplasm is alive, the scientist turns to philosophy to supply that which is lacking yet extremely necessary in both the other theories. It is an explanation which is proposed by those who wish not to deny either mechanism or vitalism. This viewpoint is commonly designated "emergent evolution," a name which tends to make the theory unpopular with some because of the name rather than because of the statements of the theory. Those who hold this theory call attention to the common fact that when organic molecules are assembled in a certain way, they exhibit properties quite unlike those which they show when brought together in another way. To illustrate, glucose is a sugar of certain qualities, not only because it is made up of carbon, hydrogen, and oxygen, but because of the way in which these elements are put together. Many other compounds consist of the same elements, yet are not glucose. In brief, a whole is more than the sum of its parts, not merely because of its complexity but because in the functional whole we have another type of system.

In speaking of this theory, the American philosopher E. A. Singer would probably say that living matter is a mechanism obeying all natural laws, but it is incapable of definition or explanation. The parts which make up the system are explainable or definable, but the collective all is indefinable. Such a viewpoint recognizes the possibility of producing protoplasm artificially in the laboratory but denies the probability. There would be just as much hope of a child constructing an intricate chronometer as for the most astute chemist to produce living protoplasm.

This philosophy which interprets living matter as an organized functional system is, as Seifriz expresses it, not only an escape from a too-rigid acceptance of either the mechanistic or vitalistic concepts, but it is also an escape from the fatalistic attitude of those who bemoan the harsh severity of experimental science. There has been of late a very evident drift away from the philosophy of Helmholtz, who declared that "the final aim of all natural science is to resolve itself into mechanics."

The reaction against mechanism has existed ever since the theory was first advanced in later medieval times. William Keith Brooks early voiced his objection to the thoughts of his mind being regarded as the "rattle of machinery." Kepner, in recognition of the fact that the amoeba meets such contingencies as the one already mentioned, has more recently stated that "this fact carries us beyond science, whether we like it or not." Jennings says, "Emergent evolution does away with that monstrous absurdity that has so long been a reproach to biological science—the doctrine that ideas, ideals, purposes have no effect on behavior."

Seifriz says that "certain phenomena, such as gravitation and life, have so far defied all attempts at a purely mechanical interpretation. Perhaps they will continue to do so. We need never hope for a machine that will reproduce the thoughts of Newton, the emotions of Beethoven, or the inspiration of Michelangelo. Yet our only safe method of procedure in science is the experimental and mechanistic one."

Are Scriptural Theories of Life Beginnings Obsolete?

I

IT IS TOO EARLY in the development of the thought of this book to consider the subject of this chapter in all its aspects. It seems appropriate, however, to insert here a short discussion of beginnings from the point of view of the special creationist upon the origin and continuance of life on our earth. The title of this chapter is not my own but is suggested by the unanimity of opinion expressed in practically all biological textbooks of our country. A representative expression of this opinion is found in a recent text in general biology. It is couched in these words:

> "Advancement of science has rendered the Scriptural theories of life beginnings obsolete." [1]

The biology text from which this quotation is taken was written for the express purpose of giving biological information to thousands of freshman college students. It is unnecessary to say that the material in such a book should be very carefully selected in order not to build incorrect foundations for this science in the thinking of these young students. The student generally has been ready to accept the idea that scientists speak truth because

[1] E. E. Stanford, *Man and the Living World*, p. 33.

they build upon facts only. In other words, the student enters the biology class in a very receptive mood and usually takes any such bald statement in his text as one hundred per cent true. That this author and many other authors of biology texts believe this statement to be true we do not doubt. But let us consider it for a moment from the point of view of fact.

The author of this statement very appropriately remarks:

> "The writers of Genesis and of later portions of Scripture were not primarily interested in such beginnings of science as existed in their day. They were absorbed in the relations of man with the Infinite, and of man with man. In these, their major objectives, the noblest of their interpretations have justified themselves through the years." [2]

Since this present volume is an exposition of the theory of special creation, I must say that creationists agree heartily with the author in this second quotation. However, in addition, they hold that statements in the Scriptures relative to scientific truths, however incidentally they may be made, are also true. These statements were made from the point of view of man at the time they were written and in his language but are nevertheless as true as any other parts of the Record.

II

In reading Bible statements today the reader must hold in mind the fact that the statements concerning scientific truths are expressed in such a way that they could be understood by man living in the day they were written. Far too many Bible readers overlook this point and make

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[2] *Ibid.*

unfair and unjustified demands upon its statements. To illustrate: We read in any popular literature of our day the expression, "The sun set," or, "The moon dropped behind the distant mountains," and have no question in our minds regarding what the author is saying. But when we read the Bible we often appear to think that it should not say, "Now when the sun was set," but rather something like this, "Now when the earth had turned on its axis in its motion round the sun until that particular portion of its surface upon which the disciples stood had moved into the shadow cast in full sunshine by the opacity of the earth's slightly flattened sphere." It is very evident that if these allusions to facts in natural history had been written in language that only modern scientists could have understood, the Bible would have failed in its mission of revealing what the Creator intended that the work of His hand should know and do.

III

The assertion of many modern authors of science books is that Scriptural theories of life beginnings are obsolete. What are these theories? As we have already remarked in preceding chapters, the special creationist does not here depend upon the interpretations men have made since Genesis was written. These are all brushed aside as he reads the original record for himself. The major share of opinion against the veracity of the Bible in scientific matters is the result of men's listening today to how someone else reads the record instead of reading it for themselves. The smudge of old wives' tales concerning what the Bible teaches has confused the minds of many brilliant men who let someone else read for them.

This obscuring cloud of hearsay must be cleared away before anyone is in a position to state what the Bible actually says.

The frequent inaccurate reading of the Bible record is illustrated by the following quotation from a text on general biology written for college freshmen. This statement is included in a discussion of the subject of spontaneous generation:

> "The Bible alludes to this belief [in spontaneous generation] when Samson propounded his riddle, 'Out of the eater came forth meat, and out of the strong came forth sweetness.' Samson saw flies coming out of the decaying body of a lion, took the flies for bees, which he believed were arising spontaneously from the lion's body, hence the riddle." [3]

There appears to be nothing vicious or premeditatedly deceptive about this statement, but it does illustrate the inaccurate reading so frequently done in the Bible. The reading of this simple story of Samson [4] shows that he did not at all believe in spontaneous generation. He had killed a lion on a previous trip, and the carcass of this lion had become mummified in the dry heat of that country. As he passed the carcass on this second journey, he found that a swarm of wild bees was in it and that they had stored some honey. He ate of this honey and took the remainder home to his parents. A reading of this story gives not the slightest suggestion that Samson saw flies and thought they were bees. He was entirely correct in saying that "meat" had come from the body of the eater and that sweetness had come from the strong.

Another illustration of inaccurate reading of the Bible or even of entire failure to read it, is found in the experi-

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[3] G. W. Hunter, H. E. Walter, and G. W. Hunter III, *Biology, the Story of Living Things,* p. 405.

[4] Judges 14.

ence of a scientist friend of mine which he recently related to me. In a class which was being taught by the head of one of the departments of a university whose student enrollment averages more than ten thousand each year, the lecturer referred disparagingly to the creation record as detailed in chapters 1 and 2 of Genesis.

"Why," said he, "the Bible is so self-contradictory! Genesis 2 tells a story totally different from that given in Genesis 1."

After class my friend took occasion to call upon the professor to ask for some explanation of his remarks and for enlightenment in regard to what particular way Genesis 1 and 2 were mutually contradictory. The professor could not answer the question. When pressed harder, he smiled and said, "Oh well, you go home and read it and you will find that there are major discrepancies."

My friend replied, "But I have read the chapters frequently and with great care and found no such discrepancies."

"Well," was the rejoinder, "you just go and read them again and you will find that the chapters are contradictory."

When further pressed for an explanation of just what he had in mind, he finally confessed he did not know and could give no answer as to just how these two chapters were so self-contradictory. Such brash and blatant recitals by uninformed teachers are gulped down by gullible students who pass them on with the sincere belief that they are making truthful statements. The professors apparently must get their information in the same way.

I can illustrate this matter further from my own experience. I was once a member of a class of university students which was obliged to sit and listen to a professor,

a recognized scientist of our day, ridicule the Bible as a book of fables, because, as he said, it taught that pregnant goats and cows have merely to look at spotted sticks to cause their young to be marked in a similar way. Unwittingly, that professor was revealing to his class that, if he had read at all he was a superficial reader, because the verses of the following chapter [5] clearly show that Jacob was the only one who thought that the markings were produced in that way. God later revealed the truth to him —the sires of the flock were, in their heredity, ring-streaked, speckled, and spotted.[6] The true harmony between the Bible story of Jacob's experience with Laban's stock and scientific facts has been clearly shown by J. P. Van Haitsma in his little book *The Supplanter Undeceived* (see Van Haitsma in Literature Cited). The chances are that the professor had never read the record, but was merely quoting what someone had told him. Whatever the history of the case, he was making before that class of students some extremely unfortunate generalizations regarding the veracity of the Bible which were entirely without foundation in fact. Whether I was an evolutionist or a creationist, I should greatly deplore any recourse to untruthfulness and misrepresentation of facts in order to swing people to my point of view. Scientists in their own right will dig out the *facts* and form their opinions in harmony with them, letting the chips lie where they fall.

IV

What are the Bible theories of beginnings? To begin with, the special creationist does not find *theories,* he finds only *one.* That theory, expressed first in the first chapter

[5] Genesis 31. [6] Genesis 31:9-12.

of Genesis and repeated many, many times throughout the Bible, states that *God created* all things in the beginning of this earth's history. The Bible is one harmonious, unified affirmation of this truth. Evolutionists state that the "advancement of science has rendered [this statement] . . . obsolete."[7] Are they merely making a sweeping and exaggerated statement for the purpose of emphasis, or do they have just grounds for such a conclusion? At this point in the development of the subject under consideration in this book, we are ready to discuss only the origin of protoplasm from the point of view of the special creationist. The last two chapters have prepared the way, and many creationist readers may feel that at the present time our discussion of mechanistic processes in biological phenomena has left them out on a limb with no place for the Bible theory of origins.

We have already recognized the paucity of detail in the Bible record of origins. Except for the bare statement that God created plants and animals in six literal days, we are told nothing about details in any other cases than that of man. In supplying a few details to the basic facts of the first chapter, the second chapter of Genesis records that man was first formed of dust and then was made alive by the "breath of life" from the Creator. The record does not say that the body was compounded of carbon, hydrogen, oxygen, nitrogen, sodium, magnesium, potassium, calcium, iodine, iron, chlorine, phosphorus, sulfur, silicon, copper, fluorine, etc. The common people would not have understood; hence the record is that "dust" was the material. Everyone knows what dust is. Neither does the record say how the Creator made that

[7]E. E. Stanford, *Man and the Living World*, p. 33.

nonliving protoplasm in Adam's body alive. There it was, in the same condition as was the plasmodium which had been pushed through the screen.

Then God did something to it which made it alive. Possibly He arranged the elements in the cells of Adam's body into a dynamic and extremely intricate system in which long, slender molecules of organic substances were a predominant feature. At any rate, what was done was that which only God could do, the nonliving protoplasmic masses were changed into that state which existed in the plasmodium before it was pushed through the screen. This organization made it "alive," and Adam was transformed from a dead soul into a living soul.

If the record had described the creation in a similar manner, it would have been but a meaningless series of words to the common people. In order to be of practical value the story had to be told in common speech. So the author of Genesis merely said, "The Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul." [8] Most certainly the fact could not be recorded in more sensible language. The crowd knew what the breath was. As long as a person or animal was breathing he was alive. When he stopped breathing, his breath was no longer in him and he died. The "breath" was the sign of inward existing life, and God was the Author and Maintainer of that life.

V

The Bible refers to the similarity between the protoplasm of man and that of beast in these words, "For that which befalleth the sons of men befalleth beasts; even

[8] Genesis 2:7.

one thing befalleth them: as the one dieth, so dieth the other; yea, they have all one breath; so that a man hath no pre-eminence above a beast: for all is vanity. All go unto one place; all are of the dust, and all turn to dust again." [9]

Job, in speaking of God, says, "If He set His heart upon man, if He gather unto Himself his spirit and his breath; all flesh shall perish together, and man shall turn again unto dust." [10] Depriving man of his spirit God calls gathering it to Himself, an expression fully as strong as "the spirit shall return unto God who gave it."[11] When protoplasm dies, that which God gave it returns to Him. It returns in the same way in which it comes from Him.

Man can prepare and has prepared many mixtures of dust, but he cannot do what is necessary to quicken it into life. Life comes only from God, because He is the only one who can impart to protoplasm the necessary organization. It will be observed that this theory differs from that of emergent evolution only in the point that God is necessary in accomplishing the peculiar organization of protoplasm which makes it alive. This, I would assume, is the sense in which the breath of life is said to come from God.

VI

With this simple portrayal of the origin of living protoplasm before us, this question beats itself into our minds, "How can we possibly say that the Scriptural theory of life beginnings is obsolete?" In the last chapter we have observed that the more minutely we study protoplasm the more certain we become that there is some

[9] Ecclesiastes 3:19, 20.
[10] Job 34:14, 15.
[11] Ecclesiastes 12:7.

peculiar and distinctive organization within it which is found in no nonliving system. A large number of our scientists are recognizing this fact and are swinging to the theory of emergent evolution.

The Biblical account corroborates this recently discovered, peculiar structure and merely adds the additional thought that it is God who first formed this material and energized it and who continues to energize it. This fact explains why biochemists have repeatedly met with failure in their attempt to synthesize living protoplasm. Instead of being obsolete, the Biblical theory leads on ahead of the most advanced research and points toward that conclusion to which so many scientists are beginning to turn.

What a travesty of knowledge is found in the fact that the great majority of the science texts of our day make basely false statements against the teachings of the Bible! The searcher for truth, in some mysterious way hard to understand, refuses to recognize or at least to admit certain truths, and continues to becloud the open minds of the youth in our schools in the matter of what are facts.

Whether the scientist wishes to accept the inspiration of the Bible or not, if he is going to make reference to it before students, he should at least know what it actually says and what it does not say, and then be truthful enough to list the facts in the case. He studies long and carefully in order to ascertain from the meandering record just what the dilettante Darwin believed. Why does he not use equal care in determining the simple record of origins as portrayed by Moses?

Truth may exist anywhere. How can we balance our acquisitions of it if we ignore possible sources? The evolutionist frequently accuses the special creationist of being narrow-minded and ignorant of facts. There is little

doubt that many creationists have a greater breadth of mind and are more widely read in facts than are their egotistical accusers. My personal experience has been that science students under creationist teachers usually have a broader understanding of theories of origins than have those who study all life phenomena only in the light of evolution.

VII

Attention has been directed in a previous chapter to the fact that the Bible record of origin and of continuance of protoplasm contains no details which negate the idea of the importance of physicochemical laws in the living phenomena. The special creationist finds the essentially basic facts in the Bible, but with no further detail from that source he must delve into natural research in order to discover how God does this or that. Bible and nature agree that life processes are maintained through the operation of laws of physics and chemistry.

Some students of the Bible have assumed that they themselves were literally and personally carried in the hollow of God's hand and could with impunity transgress natural laws. That past records unquestionably reveal that God does rarely suspend the relation of cause and effect in behalf of man goes with only feeble challenge. However, by far and large, all natural happenings occur as they are produced through the operation of natural laws. From the point of view of the creationist, God operates through natural forces, and these forces are but expressions of His power. A study of Bible and nature can lead to no other conclusion.

It appears that from the insemination of the egg which determined our sex until the present moment in

which we live, because of the operation of such chemical laws as hydrolysis and condensation, oxidation and reduction, and because of such physical laws as cohesion, adhesion, imbibition, diffusion, and adsorption, our life has continued, owing to the constant operation of physicochemical laws within us and around us. We can be carried in the hollow of God's hand only as we fit harmoniously into our physicochemical environment.

Even though a man be the humble and godly pastor of an active church, and even though he decide to save means to help others by shingling the church building himself, still if he is nailing down shingles on the roof and finds his supply exhausted, he is forced to climb down the ladder to get to the supply on the ground. He dares not jump, for gravity will destroy him although he is engaged in wholly unselfish work. He may be on his way to pray with the sick, but if on that journey he steps in front of a speeding car his life will be as quickly snuffed as if he were an extremely selfish man. The facts of every day teach us in no hidden manner that we live in an environment controlled by laws of physics and chemistry which operate in certain definite and real ways. The Bible teaches it and nature teaches it. In fact, the operation of regular forces of cause and effect is taught *throughout* the Bible. As simple an act as driving a nail with a hammer will teach us that the same law operates today.

VIII

In this very real and very orderly universe even the basic substance of living organisms is subject to the same physical laws. The plasmodium lives until we push it through the screen. Life itself appears to depend upon

these laws. The special creationist accepts this position, for he reads, "In Him we live, and move, and have our being." [12] That is the statement of Scripture and that is the testimony of nature. Viewed from one angle, we live in a hard world under inexorable law, unless God should see fit to perform a miracle for us. But after all, that very law produces a cosmos and thereby reveals a Supreme Intelligence. We know what to expect and what to do to enjoy peace. Such knowledge and such an existence would be impossible in a chaos. An extremely miserable life and probably a short one would lie before all organisms if our natural forces were not fairly regular in their operations. As it is, life is sweet to all forms of protoplasm. The providences of an orderly yet loving Infinite Being make it so.

We must recognize that this philosophy of the special creationist, built upon the statements of the Bible and upon evidences in nature, stands as one of the most sensible. The Biblical theory of origins and of continued existence, far from being obsolete, rather gives a reasonable exposition of past phenomena, and a totally satisfactory explanation of those of our present day.

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[12] Acts 17:28.

★ ★ ★ CHAPTER SEVEN ★ ★ ★

Processes of Variation in Organisms

I

WHEN THE EMINENT American zoologist, Louis Agassiz (1807-1873), an adherent of the theory of special creation, gave it as his opinion that the blind fishes of caves "were created under the circumstances in which they now live, within the limits over which they now range, and with the structural peculiarities which now characterize them," [1] he added the capsheaf to the pile of unsound opinions which had accumulated over the theory of special creation and which had well-nigh reduced the theory to a ridiculous absurdity in the mind of the informed general public.

It was and is this type of narrowness of conception and of refusal to recognize facts which at times and in places has made the special creationist almost deserving of one or more of the descriptive words given by Newman—i. e., "ignorant," "dogmatic," and "prejudiced." More damage can be done to the pure theory of special creation in five minutes at the hands of prejudiced adherents than can be undone by years of hard work in the realm of education regarding the true assertions of the theory.

Agassiz could present no further Scriptural reason for his peculiar conclusion than the brief statement of Genesis

[1] H. H. Newman, *Evolution, Genetics, and Eugenics*, p. 73.

that each was made to reproduce "after his kind." His conclusions regarding blind fishes is a far cry from the statements of Genesis. Complementary to and expository of the Biblical statements are the facts of nature. With regard to the innumerable varieties, races, "species," and even concerning many of the larger groups of organisms on the earth today, the creationist, with the evolutionist, studies the present-day processes of change with the hope that he may thereby discover the mechanism of variation which has given rise to this amazing complexity of organic life.

It will be recalled that, according to the statements of the theories of evolution and of special creation given in Chapter Two, the adherents of these descriptions of the theories agree in recognizing the operation of natural processes of change in living organisms. The evolutionist studies these forces in order to learn how evolution occurred. The creationist studies them to discover, among other problems, how it was possible at one time for Noah's ark to contain all the created kinds of land animals when today modern "species" are numbered by the hundreds of thousands. [2]

It does not require any great power of observation to see that every human individual is unique. He is different from every other one. This is very likely true of every other species. We do not, however, have methods for determining whether this is true in the cases of all plants and animals. A point which we are very sure of is that, equal with the fact of diversity, is that of *discontinuity*. Organisms cannot be found grading gradually one into the other. We recognize men, apes, dogs, horses, oak trees,

[2]R. W. Hegner, *College Zoology*, 4th ed., p. 2; H. S. Pratt, *A Manual of the Common Invertebrate Animals Exclusive of Insects*, p. 9.

wheat, and roses. There is never any confusion in the minds of taxonomists whether a primate is a man or a chimpanzee, or whether a rodent is a squirrel or a prairie dog. So very manifest is this discontinuity that systematists erect "genera," "orders," "classes," and "phyla" with ease. Some investigators, e. g., Turesson,[3] claim to recognize discontinuity between modern "species" and even speak of "bridgeless gaps between some of them."

II

A scientific study of variation among organisms can be made in two different ways. First, in a generalizing way, one may list the differences in the structures of organisms, and, with such a list fairly complete, proceed to catalogue plants and animals according to their similarities and dissimilarities of morphology. Second, by exact induction, one may study the forces of change which underlie this diversity and endeavor to determine how they operate. In the earlier days of its history, biological science used the generalizing method and attempted to discover some system and order among the apparent confusion of forms. Thus taxonomy and morphology took precedence among biological sciences during the eighteenth and nineteenth centuries. In recent years physiological aspects have drawn the major attention, and with the introduction of quantitative methods a shift from the observational to the experimental procedure has occurred.

A study of the science of genetics is one of the subdivisions of this latter method of attack. Contrary to the opinion of not a few, genetics is not the theory of evolu-

[3]G. Turesson, "The Genotypical Response of the Plant Species to Habitat," *Hereditas*, 1922, Vol. 3, p. 343.

tion in sheep's clothing, but rather is an honest attempt to discover how hereditary characteristics are transmitted and how variation comes about. As was true of the study of biology in general, no real progress occurred in the study of genetics until the operation of physicochemical laws was recognized in the structure and behavior of the carriers of hereditary traits. Signal success in unraveling the problems of genetics occurred when the mechanism of the transmission of hereditary characteristics from parents to offspring was held to depend upon discrete particles known as genes.

The gene theory of the hereditary mechanism has been viewed with suspicion by some creationists, but I do not believe that such an attitude is justifiable. To the contrary, the theory fits the facts of heredity amazingly well and there assuredly is nothing anti-Biblical in it. A few years of continued research in the genetical field may possibly disprove the gene theory, but for the present, at least, it seems to be a very useful tool in understanding and explaining natural phenomena in the field of genetics.

III

Among the many constituents of the cell, the chromosomes have claimed most of the attention of the researchers. That these nuclear constituents are the physical bearers of heredity was demonstrated before the close of the last century. When Mendel's account of his experiments performed in the 1860's was discovered in 1900, it was noted that a striking series of parallels existed between the behavior of hereditary factors on the one hand and the behavior of chromosomes on the other hand.

Sutton and Boveri in 1903 and 1904, respectively,

pointed out that the transmission of hereditary factors could be understood only if they were carried on the chromosomes. Morgan, Bridges, Sturtevant, and Müller have demonstrated the individualism of the chromosomes and that the hereditary factors exist in a linear arrangement in their centers. This linear arrangement has been conclusively shown by Müller, Painter, Dobzhansky, Stern, McClintock, and others through fragmentation by X rays and other causes and through genetic experiments. These experiments have shown that the determiners, or genes, maintain their individual characters and powers of self-reproduction regardless of their position in the chromosomes.

Further investigation has revealed that although each gene is apparently a separate unit, still a condition of interdependence exists between it and neighboring genes. This mutual influence (position effect) of one upon the other in the production of hereditary characters has led some to believe that no such things as discrete genes can exist. It is a fact that genes have never been seen, but neither have molecules been seen. Practically all geneticists feel as well satisfied with the gene theory of inheritance as are the physical scientists with the molecular theory of the structure of all matter.

The assumption that genes exist is quite essential to an understanding of Mendelian segregation of traits distinguishing the parental forms in the second and the following generations of hybrids. This segregation and recombination is evidence that the germ plasm of chromosomes is not one continuous structure. The breaking of chromosomes by X rays, or naturally, furnishes evidence that portions of chromosomes may be physically separated with possible change in developmental functions but with-

out loss of the ability to reproduce themselves. That genes are separate entities does not determine that they cannot be integrated into functioning systems any more than the unified action of heart muscles does not necessarily indicate that any one of them is not composed of individual muscle cells.

Concerning genes Dobzhansky says:

> "Genes may prove to be separate molecules or molecular aggregates loosely held together by some relatively inert substance; or they may be merely links of an enormously long chain molecule; or they may be molecular nuclei connected with their neighbors by chemical bonds. No matter which of these possibilities, if any, will prove to be true, the existence of genes is as well established as that of molecules and atoms in chemistry. It is also virtually certain that genes are bodies of the order of magnitude of large molecules, and hence one must beware of thinking about them and their possible connections in terms of crude mechanical analogies." [4]

IV

If we follow the classification of Sinnott and Dunn,[5] all known processes of variation in organisms may be grouped under two main heads: (*a*) those changes in appearance which are due to *environmental effects* such as the bodily differences of two men, one having suffered severely from mineral and vitamin deficiency and the other having had the benefits of a normal diet, or the stunted growth of trees at the timber line in contrast with the magnificent development of their kin at lower levels; and (*b*) *autogenous* variations, or those which arise from changes within the hereditary substance. As far as can be discovered, the former effects do not cause any change in hereditary traits, while the latter changes furnish vari-

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[4]Theodosius Dobzhansky, *Genetics and the Origin of Species,* p. 111.
[5]E. W. Sinnott and L. C. Dunn, *Principles of Genetics,* 3d ed., pp. 21-34.

ations which are inherited according to Mendel's principles.

Autogenous variations may be classified for convenience into three main categories: (*a*) recombinations, (*b*) gene mutations, and (*c*) chromosome changes. Illustrations of recombinations are found in the birth of a red-and-white calf to a Holstein line which has been only black and white for a number of generations; in the appearance of a walnut comb on a fowl with single and rose-combed parents; and in the production of gray rats by crossing a black parent with a yellow one. These effects are known as reversions, or "throwbacks," and are not, properly speaking, new differences. Although they constitute the commonest source of differently appearing individuals, still they can give rise to nothing really new, for they are due to arrangements of genetic elements already in existence and have without doubt already appeared many times in the history of the animal or plant.

Gene, or point, mutations, on the other hand, are at once the hope of both the evolutionist and the special creationist. The former individual believes that here lies the greatest possibility for evolutionary change, while the latter sees in mutation the chief source of the multiplicity of variation which has occurred during the centuries since the flood. In discussing this subject, Walter states:

> "Mutations, on the contrary, like Minerva springing full-fledged from the head of Jove, are something qualitatively new, which appear abruptly without transitional steps or any apparent environmental cause, and breed true from the very first." [6]

Typical conspicuous mutations in plants are the Shirley poppy, remarkable for its wide range of colors, which originated from a single plant of a small red poppy com-

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[6] H. E. Walter, *Genetics*, p. 31.

mon in English cornfields; double petunias, roses, azaleas, stocks, carnations, daisies, and other species which arose from single-flowered plants; dwarf portulaca; striped sugar cane; blotched leaf in maize; the Boston fern; red sunflowers; red sweet potatoes; seedless oranges; spineless cacti, etc. Typical, easily observed mutations in animals are the short-legged or Ancon breed of sheep; albino men, and other albino animals, such as rabbits, rats, mice, guinea pigs, foxes, skunks, squirrels, birds, etc.; hornless cattle; double-eared cattle; pacing horses; many-toed cats; mule-footed swine; bulldog-faced dogs, etc.

V

In order to give some idea of the nature of mutations, and at the same time to give a little clearer picture of genes, I will select some of the facts, principles, and inferences relating to them which have grown out of the investigations of Morgan, Müller, Demerec, Emerson, Stadler, and their colleagues, and which are listed by Snyder: Most genes are exceedingly stable; different genes have different rates of mutation; mutations may occur at any point in the life history of an organism; a mutation is a change in a gene, not the loss of a gene; the changes in genes appear to be chemical processes; mutations are usually harmful to the organism; mutations are usually recessive to the wild, or normal, type; the two members of a pair of genes mutate independently, just as different genes do; mutations with slight effects are much more common than those with marked effects; mutations with no visible effects are the most common of all; genes are ultramicroscopic in size; and genes are self-propagating.[7]

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[7]L. H. Snyder, *The Principles of Heredity*, pp. 217-232.

According to this view the gene is a large complex organic molecule occupying a specific place among a group of such molecules arranged in linear order. Each string of molecules composes the essential part of a chromosome. If genes are as pictured here, a rearrangement of the atoms could occur in any one of numerous ways, each rearrangement having important effects upon the chemical nature of the molecule. It is possible that such rearrangements are the basis of mutations.

VI

At this point I might state that, the opinion of some creationists notwithstanding, I believe it is entirely within the facts concerning genes and mutations to assume that all the different breeds of men now on the earth have arisen from one type of man through processes of mutation which have given rise not only to such superficial characters as pigmentation of the skin and differences in features, but also to the different blood groups, variations in natural immunity, different degrees of intelligence, and to the various fundamental nerve patterns which give predispositions to this or to that.

Perhaps I should explain this opinion somewhat. In the first place, it does not preclude the possibility that a supernatural power, either good or evil, directed natural processes of variation in order to bring about the appearance of the basic human races, but it does suggest that the force which was responsible for the development of these races worked largely through the process of mutation to accomplish the changes from father Adam's type. It might be assumed that many of these possibilities for variation were created in the first man. On the other

hand, it does not seem reasonable to me for the creationist to assume that genes for low intelligence and feeble-mindedness, or for allergic reactions to foreign proteins—e. g., those for ivy poison or for ragweed pollen—existed as recessives in the first man. Yet today these abnormalities, along with diabetes, hemophilia, color blindness, proclivities for tuberculosis and other diseases, etc., are just as truly heritable [8] as are those other variables named in this section. Upon what basis can we argue that some of these "abnormalities" have arisen in the line through mutational changes since creation while others which are heritable in the same way were caused to appear in some miraculous manner? It is true that such may have been their origin, but it is more harmonious with the laws of variation to assume that changes in man from the original type have been accomplished in natural ways. Such an assumption still leaves the assumer free to choose his own directing force, i. e., whether natural or supernatural.

VII

Some idea of the diversity of mutational change can be gained from a survey of the records of such changes which have been observed in the geneticist's godsend in the form of the small vinegar fly, *Drosophila melanogaster*. I shall select a few from Dobzhansky's [9] list. Some mutations affect the coloration of all external parts of the body, and of the eyes, as well as internal parts; others the length, diameter, and shape of bristles. Other mutations influence the size of the eyes, antennae, legs and their parts, and the form and arrangement of the individual units of

[8] S. J. Holmes, *Human Genetics and Its Social Import,* p. 105; D. D. Whitney, *Family Treasures,* p. 21.

[9] Theodosius Dobzhansky, *Genetics and the Origin of Species,* pp. 23, 24.

the large compound eyes. One class of mutations transforms some body organs into others, e. g., the balancers into a second pair of wings and the antennae into legs. The number, shape, and appearance of eggs are changed. Changes in developmental stages cause differences in the size, shape, and weight of larvae, pupae, and adults. The size of the brain is changed to correspond with the change or absence of eyes. Such physiological characters as reaction to light and gravity, sex-determining factors, longevity, length of development, and manner of growth are affected. Mutations are known to produce tumorlike growths in various organs and at various developmental stages. Lethal changes may cause death at any stage of development from fertilized egg to adult.

Such is the great variety of effects in *Drosophila* which appear to be caused by mutation. It requires no great imagination to conceive of the great superficial change which such a force may have upon the face of organic nature even in a few dozen centuries. By using the word "superficial" I am not indicating that I overlook the fact that fundamental characters may be affected. In the eyes of the taxonomist nothing could be more fundamental than for a dipteran to be changed to an insect with four wings. I use "superficial" in the sense that, after all the hundreds of mutations of *Drosophila* have been recognized, still there is *never any question but that the mutated form is still a vinegar fly.* Dobzhansky gives recognition to this fact in these words:

> "We need not consider here the fact that systemic mutations [which transform one "species" at once into another] have never been observed, and that it is extremely improbable that species are formed in so abrupt a manner." [10]

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[10] *Ibid.*, p. 80.

VIII

Although mutations are usually deteriorations, yet it does not follow that such changes would necessarily always mean the annihilation of the mutant form. It would seem fatal for a mutation to result in loss of eyes, yet many fish, salamanders, and insects have no eyes. These largely find survival possible in caves. Mutations cause atrophy of mouth parts with resultant impossibility of taking food, yet the adults of many groups of insects have such unusable mouth parts and take food only in the larval stage. Some of our most beautiful moths, insects which are definitely successful, as illustrated by Promethea, Luna, Cecropia, and Polyphemus, are unable to take food in the adult stage because of atrophied mouth parts. The only energy materials available during the one to two weeks of adult life are those which were eaten during the larval stage.

Loss of wings by mutation might appear to be an impossible handicap, yet we find that the logger-head duck lives successfully along the Amazon although its small wings can lift it from the water only before the adult stage of development is reached. The young ducks fly, the adults cannot. Wingless mutants of winged forms of insects find life possible on windy oceanic islands, while their winged brothers and sisters are blown out to sea. We find the kiwi (*Apteryx*) of New Zealand getting along successfully under the conditions of his particular environment even though his wings are but useless small appendages.

The total loss of teeth might seem fatal to an animal; however, it is but regular procedure for embryo whalebone whales to have teeth which resorb before birth

and are entirely lacking in the successful adult whales.[11] Twisted mutant bills in domestic fowls appear to present a character of low survival value; yet the crossbill is a definitely successful bird, using a crossed bill very advantageously in separating the sporophylls of pine cones and extracting the seeds.

The failure of pollen grains to reach maturity would seem to be the end of a flowering plant, yet we cannot consider the dandelion to be unsuccessful even though no dandelion pollen is viable. All the seeds develop without the stimulation of any male cell. The loss of the ability to produce flowers would likewise seem to be serious in the survival of flowering plants, yet a number of our prairie grasses propagate almost entirely by such vegetative structures as stolons and rhizomes. A consideration of these facts leads us to appreciate more fully the possible role of mutation in producing the great variety among both plant and animal forms.

IX

At first thought the various changes which I have cited in the last three paragraphs as illustrations of what mutation may have done in producing differences among organisms seem, to some creationists, to be misleading. This conclusion is reached by them because they feel that changes of such magnitude would require more than one mutation and that the chance that even *two correlated* mutational changes could occur is *extremely* small. For instance, it is assumed that the atrophy of mouth parts among the large Saturniid moths would have to be accompanied with a closely interrelated series of mutations mak-

[11] W. J. Hamilton, Jr., *American Mammals*, p. 68.

ing it unnecessary for the adult to take food. *If* such a series of changes *were* necessary to produce this situation, I, with these individuals, would hold that the idea that such changes were produced by mutations was unsound. But single mutational changes *do occur* which are great enough to accomplish any one of these situations I have cited above, except, perhaps, in the case of the dandelion. Experimental evidence indicates that even such large changes as these are in each case confined to change in a single gene locus.

In the case of the Saturniid moths it is not necessary to assume that any other changes would be required than a single one which would affect the moth parts. True, a number of these large Saturniids live several days without food. In the instance of the Cecropia moth, I found [12] that both males and females would occasionally remain alive for as long as seventeen days. But from this it does not follow that a special compensating mutational chain would be necessary to make this activity without food possible in the adult stage. In my study of chalcid and ichneumonoid wasps I found that the adults would take dilute honey very greedily, but those which took water and no food lived just as long as those which took water and food. In the case of the ichneumonoid, *Spilocryptus extrematis,* I found [13] that males would live as long as twelve days and females as long as sixteen days, and that food taking had *no effect* on their life span. It is in the light of these observations, supported by abundance of illustrations of mutations sufficiently large to cause

[12]Frank L. Marsh, "A Few Life-History Details of *Samia cecropia* Within the Southwestern Limits of Chicago," *Ecology,* July, 1941, Vol. 22, pp. 331-337.

[13]Frank L. Marsh, "Biology of the Ichneumonid *Spilocryptus extrematis* Cresson (Hymenoptera)," *Annals of the Entomological Society of America,* March, 1937, Vol. 30, No. 1, pp. 40-42.

atrophy of all mouth parts of a moth, that I conclude that single mutations could accomplish changes as great as those suggested above.

That group of anomalous cases in nature which the dandelion illustrates, constitutes a very interesting type of variation. In the dandelion and in a few other angiosperms the male sex cells fail to come to maturity. The plant, however, is still able to mature its seed because of the unusual performance of the "egg" cell in which no reduction of chromosome number occurs. The "egg" is independent of the "sperm," being able of itself to develop into a new individual with a full set of chromosomes. A similar situation exists in some ferns in which the "egg"-producing and "sperm"-producing structures are present but produce nonfunctional gametes. In these forms the young "fern" plants arise directly from buds which sprout from the parent plant instead of from the fertilized "egg," as in most ferns.

If the creationist were to maintain that these unusual forms were created that way, he would still, in order to be reasonable, have to explain why, in a world in which the principle of least action prevails, the Creator chose in exceptional cases to waste energy in building the pollen grains in the dandelion, and the antheridia and archegonia of the ferns, merely to produce sex cells which were incapable of functioning. It seems to me that a more reasonable assumption would be that this anomalous condition has developed through natural changes since creation.

The assumption that it could arise from two or more separate mutations is unsound for two reasons. First, the chance that even *two* such nicely integrated mutations would occur at the same time is so extremely slight as to

be impractical as an explanation. Second, a change which resulted in inviable "sperms" occurring before a change which enabled the "eggs" to retain their diploid or normal number would result in the annihilation of these plants. On the other hand, an occurrence of the mutation in the "egg" before that in the "sperm" would result in a few generations in a monstrous type of ploidy which would certainly be incompatible with life. In the light of these considerations it seems to me that the changes from the original state must have occurred at the same time, and that a single mutation is the most sensible natural agency to credit with this result.

X

A word of caution would be very appropriate here in the matter of directing attention to the limitations of mutation. It is a well-known fact that evolutionists look upon mutation as the Aladdin's lamp which will supply any of the changes necessary to bridge the gap from one kind of organism to some new kind. This unjustified optimism of evolutionists has led many creationists to be suspicious of any claims of what mutation can do. In order to discover the significance of mutation in the production of variation, very close heed must be given by both evolutionists and creationists to the actual service accomplished by this process of change. Any change which would require several integrated mutations could not occur, because the process of mutation does not function in that way. All the facts concerning mutation *do not justify* any theory which assumes that the discontinuity between kinds of organisms was built up by *series of unidirectional mutations* which occurred under the direct-

ing influence of some natural or supernatural force. Contrariwise, mutations are apparently merely chance happenings. The assumption that new kinds of organisms arose from other kinds through mutational changes is absolutely without support in nature. A vast number of such changes would have to occur before such discontinuity as exists between two kinds could develop, and the degenerative quality and haphazard nature of mutational change would produce internal changes incompatible to life long before the gap between the old kind and the new kind was bridged.

XI

The great variation in frequency of mutations in organisms has been referred to above. Some kinds of animals and plants were extremely variable, while others remained practically unchanged through the centuries. At one end of the range are stable genes which change very rarely; at the other are the so-called mutable genes, which mutate with frequencies that under certain conditions approach one hundred per cent. Many of these latter changes, as, for example, the gene for variegation in the endosperm of maize, studied by Emerson, mutate only in somatic tissue. Demerec has discovered several mutable genes in the vinegar fly and in larkspur. More conservative animals are illustrated by the painted lady butterfly, *Pyrameis cardui,* and the eel, individuals of which, although spread over wide areas, the former being cosmopolitan, always have the same appearance. Classical examples of conservatism with regard to mutation are found in the brachiopod *Lingula,* and in the ginkgo or maidenhair tree, whose living forms have an identical appearance with their fossil ancestors.

A further consideration of the possible function of mutation in the evolution of kinds and in the formation of races and "species" will be included in the latter portion of the continuation of this study of processes of variation in the next chapter.

★ ★ ★ CHAPTER EIGHT ★ ★ ★

Processes of Variation in Organisms—Continued

I

THE THIRD CLASS of autogenous variations (changes occurring within the chromosomes), continuing with the organization as given by Sinnott and Dunn, is the group known as chromosome changes. Changes in which the material involved was no larger than that of a single gene locus were called mutations. Where alterations involve greater areas, the variation is designated as a chromosome change. If these changes result in differences in chromosome number, the phenomenon is known as ploidy. Three kinds of ploidy are recognized: haploidy, where the chromosome complement contains but a single member of each normal chromosome pair; polyploidy, where each chromosome is represented by more than two; and heteroploidy, where a chromosome is subtracted from or added to the normal set. The situation in which a pair of each of the chromosomes is present is called diploidy and is considered to be the normal arrangement.

If the changes affect the number or arrangement of gene loci within a chromosome, one or more genes may be lost (deletion), or one or more genes may be added (duplication); breaking away of a part of a chromosome may be followed by attachment of the separated portion to

another chromosome (translocation), or one section of a chromosome with its block of gene loci may turn end for end, producing a different gene order (inversion).

II

Normally all the individuals of each "species" of plant or animal have the same number of chromosomes. Many "species" of plants and many animals have the same number. Although there are an estimated 840,000 "species" of animals in the world,[1] still the greatest number of chromosomes in any one, according to Wilson,[2] is about 208 in the crayfish, *Cambarus immunis*. Dobzhansky [3] states that there are several hundreds of chromosomes in some of the members of the group of one-celled animals which are called Radiolaria. This shows very clearly that great numbers of different "species" must have the same chromosome number. In a large sample containing 2,413 "species" of plants, over one half had less than twelve chromosomes as a haploid number. Twelve chromosomes in the haploid set was the modal point where 391 "species" out of the 2,413 were grouped. Eighty in this group had the same number as man.[4] I refer to this because it is quite common to find people who think that every kind of organism has a different number of chromosomes. In this connection it may be of interest to state that twenty-four pairs of chromosomes is the complement of both man and the chimpanzee.

Haploid individuals occur normally in the reproduction of such animals as bees, wasps, certain moths, and

[1]R. W. Hegner, *College Zoology*, p. 2.
[2]E. B. Wilson, *The Cell in Development and Heredity*, p. 857.
[3]Theodosius Dobzhansky, *Genetics and the Origin of Species*, p. 131.
[4]*Ibid.*, p. 225.

rotifers, in which unfertilized eggs develop into males. In some animals, e. g., starfish, frogs, salamanders, and rabbits, the eggs may be induced artificially to develop into haploid individuals. Often in such cases the diploid number is restored through a division of chromosomes not accompanied by a cellular division. Haploids have been found in several species, e. g., Jimson weed, tobacco, tomato, and wheat. Such individuals may be induced by cold, radiation, or other external changes, but because of their rarity and infertility these forms probably play little part in adding to the supply of new natural variations.

III

A different degree of importance appears to attach to polyploids. Dobzhansky and some other evolutionary workers hold that this process of variation is the most promising in the matter of erection of new "species." Two types of polyploids are recognized: autopolyploids, where there has been a multiplication of the basic chromosome number characteristic of a *single* race; and allopolyploids, where the individuals have arisen from a fusion of gametes having more than the reduced or haploid number but which have come from *different* races, "species," or "genera."

Autopolyploidy may occur spontaneously in nature or may arise from adventitious buds arising at grafts or after decapitation in tomato and nightshade plants. Some of the shoots which develop from these buds in callus tissue formed at the cut surface are polyploid. Flowers on these shoots may perpetuate the condition through sexual reproduction. Treatment of buds and seeds with the alkaloid colchicine from the autumn crocus is a simple

and effective way of inducing polyploidy experimentally. Under the influence of this alkaloid, splitting of chromosomes occurs, but the cell fails to form two daughter cells at the time, thus doubling the chromosome number.

Of particular interest to us here is the fact that autopolyploids may possibly occur naturally in the field. Müntzing lists fifty-eight such apparent examples in Europe.[5] Some very intriguing cases in our country among "species" of spiderworts (*Tradescantia*) are described by Anderson and Sax.[6] *T. occidentalis* is distributed over the Prairie States from the Rocky Mountains east to the Mississippi. Plants having twice the normal number of chromosomes (tetraploids) are found over most of this area. The range of *T. canaliculata* lies mostly east of that of the former "species," and its individuals are also largely tetraploids. However, there is a fairly broad strip just west of the Mississippi in which both "species" are largely diploid. According to Anderson, the ancestral native soil for these "species" was an area in this strip where diploid forms of both now grow. Tetraploids developed in this area and spread outward, *T. canaliculata* going chiefly east and northeast, while *T. occidentalis* spread to the north and northwest. The thought is that the tetraploid races were better adapted to these environments than were the diploid races.

As remarked by Dobzhansky,[7] the systemic effect of polyploidy is very similar to that of mutation. Any change from the normal condition which might be produced by polyploidy could be favorable for the organism

[5] A. Muntzing, "The Evolutionary Significance of Autopolyploidy," *Hereditas*, 1936, Vol. 21, pp. 270-277.

[6] Edgar Anderson and K. Sax, "A Cytological Monograph of the American Species of Tradescantia," *Botanical Gazette*, March, 1936, Vol. 97, No. 3, pp. 433-476.

[7] Theodosius Dobzhansky, *Genetics and the Origin of Species*, p. 229.

under some environmental conditions and unfavorable under others. However, since either addition or loss of chromosomes usually lessens the vitality of the offspring, the reproductive powers of the new individuals would more frequently be impaired. This would be a definite limiting factor in the usefulness of ploidy in the production of variation.

IV

Some very interesting allopolyploids have been produced in the laboratory. One of particular interest is the intergeneric hybrid between radish, *Raphanus sativus,* and cabbage, *Brassica oleracea,* made by Karpechenko.[8] Both parents have nine pairs of chromosomes and individuals of the first hybrid generation have eighteen univalents. The individuals of the first hybrid generation are nearly sterile; most plants produce no seeds at all, but some do produce a few. These seeds from this generation give rise to individuals with thirty-six chromosomes in each cell (tetraploid). These plants are irregularly fertile. Unfortunately, this hybrid has a root like the cabbage and a top like the radish. This feeble and variable plant which must be pampered in order for it to continue has been named *Raphanobrassica,* a fusion of the generic names of the radish and the cabbage. Darlington [9] lists forty-nine such allopolyploids obtained up to that time.

The production of allopolyploids in the laboratory reveals a mechanism in nature which *may* have functioned to some limited extent in producing complexity

[8] G. D. Karpechenko, "Polyploid Hybrids of *Raphanus sativus* L. × *Brassica oleracea* L.," *Bulletin of Applied Botany,* 1927, Vol. 17, pp. 305-348.
[9] C. D. Darlington, *Recent Advances in Cytology,* 2d ed., table 26, pp. 190, 191.

within original kinds. However, these forms usually show such great irregularities in the distribution of their chromosomes accompanied with prevalent infertility, that they very likely would not be able to compete successfully in nature and thereby hold their place in the sun. Thus a laboratory demonstration of the effectiveness of ploidy in the production of even new modern "species" is still largely lacking. The evidence for the service of ploidy in producing variation still remains chiefly of the subjective type.

V

There are numerous examples of plant "species" which appear to be cases of allopolyploidy. The origin of the marsh grass *Spartina townsendii,* as suggested by Huskins,[10] is an illustration of such a case. This "species" was discovered occupying a single locality in southern England in 1870. A rapid spread of this grass was recorded a short time later. By 1902 it was known to occupy thousands of acres along the English coast and in 1906 had appeared on the coast of France. Because of its desirable agricultural properties it has now been introduced into many parts of the world. Systematists have decided that because of its morphological characteristics it must be a hybrid between *S. stricta,* a native European "species" known for about three hundred years, and S. *alterniflora,* a native "species" of America which had been introduced into England and become common in some localities. The chromosome number of the former is twenty-eight pairs while that of the latter is thirty-five

[10] C. L. Huskins, "The Origin of *Spartina townsendii,*" *Genetica,* 1930, Vol. 12, No. 6, pp. 531-538.

pairs. This would mean that an allotetraploid of these two "species" would have 126 chromosomes. *S. townsendii* actually shows 126 plus or minus two. Thus it seems reasonable to assume that *S. townsendii* may have arisen as a tetraploid hybrid of the two other "species." The superior adaptability of this possible hybrid is demonstrated by its overrunning both *S. stricta* and *S. alterniflora* when meeting them in natural competition.

VI

The results of cytogenetic investigations on "species" of wheat (*Triticum*) and the related genus *Aegilops* (goat grass) made by Sax and Sax, Sapehin, Watkins, Bleier, and Kihara are interesting in this connection. Dobzhansky [11] gives a brief survey of the voluminous literature on this subject. The fifteen described "species" of wheat fall into three classes; viz., the einkorn group of three "species" each of which has seven pairs of chromosomes (diploid), the emmer group of eight "species," composing the "hard" wheats, which have fourteen pairs each (tetraploid), and the vulgare group of four "species," commonly called the "soft" wheats, each member of which has forty-two chromosomes (twenty-one pairs and hexaploid).

With few exceptions the hybrids between "species" with the same chromosome number are fully fertile. The hybrids between the members of the emmer and vulgare groups are pentaploid, showing fourteen bivalents and seven univalents at meiosis. Crosses of emmer and einkorn have from four to seven bivalents and from seven

[11] Theodosius Dobzhansky, *Genetics and the Origin of Species*, pp. 245, 246.

to thirteen univalents. The vulgare × einkorn cross produces from none to as many as ten bivalents, seven being the usual number, at least in certain crosses.

These relationships have been interpreted to mean that the einkorn, emmer, and vulgare groups have, respectively, one, two, and three sets of seven chromosomes which are different from each other. It has been thought that the "species" of the vulgare group are allohexaploids, their origin being due to a cross with a "species" of *Aegilops*. Just what the process of development has been has not yet been determined, but the case is an interesting one in that it serves as an illustration of the chromosome relations within the members of a related group. That several modern "species" have come from a few can be sensibly concluded. These variation changes of wheat are possibly of two kinds, "species" formation through new combinations of chromosome sets, and these in turn combined with gene mutations and new arrangements of genes. The very greatest apparent changes here have done no more than to erect additional varieties of "species" within the kind of grass involved in the crosses.

VII

The process of change called heteroploidy has been studied in detail in the Jimson weed (*Datura*), in the evening primrose (*Oenothera*), and in the vinegar fly (*Drosophila*). Heteroploid forms, it will be recalled, are those which differ from the normal members of the "species" by one or possibly two chromosomes more or less. This means that in some way at least one member of the usual diploid complement is lacking entirely or that there may be three members in a "pair" instead of two.

These forms appear sporadically and show numerous and generally slight departures from the wild or normal type in many characters. Because they never breed true and are of lower fertility than normal diploids, they probably do not become established as new types in nature.

That polyploidy may be very widespread among plants is indicated by an examination of the chromosome numbers of various "genera." The case of "species" of wheat with their 7, 14, and 21 pairs has been mentioned. Some other "genera" with the chromosome number of included "species" are *Chrysanthemum* 9, 18, 27, 36, and 45 pairs; meadow rue 7, 14, 21, 28, 35, and 42 pairs; roses 14, 21, 28, and 35 pairs; *Solanum* (Nightshade) 12, 18, 24, 30, 36, 48, 54, 60, and 72 pairs. Various cultivated varieties of garden flowers, vegetables, crop plants, and fruit trees appear to be polyploids. Apparent triploid and tetraploid varieties are known and cultivated among hyacinths, tulips, lilies, and others. Some varieties of these kinds of flowers were experimentally produced. Polyploidy is of considerable economic value in cultivated varieties of cotton. It is quite likely that some of the "new" forms developed by Burbank in his outcrossing experiments, if examined for their chromosomal composition, would turn out to be polyploids.

The abundance of apparent polyploids in plants and their relative scarcity among animals is one of the most striking differences within the variants in the two kingdoms. About the only authentic instances of tetraploidy in animals is in brine shrimps (*Artemia*) and the nematode worm *Ascaris*. Indications of ploidy are found in a study of the chromosome numbers of flatworms, leeches, and a few other annelids, all of which are hermaphroditic. The reason there is apparently less polyploidy in animals

than in plants may be that many higher plants are hermaphroditic, while animals are usually of two sexes differentiated by the diploid mechanism of segregation and combination.

VIII

We have yet to consider those hereditary changes which affect the number or arrangement of gene loci within a single chromosome, viz., deletion, duplication, translocation, and inversion. Deletions (deficiencies) and duplications involve losses or multiplications of some genes and are therefore basically distinct from the latter two, which merely change the arrangements of the genes and not their number. Addition or subtraction of genes is usually accompanied with effects which can be seen, while translocations and inversions may not be apparent on the surface. Illustrations of effects produced by demonstrated deficiencies are the notched wing in *Drosophila* described by Bridges and Mohr and the waltzing gait in mice explained by Gates. Mice with this deficiency in this gene complement are unable to run in a straight line, and usually run about in small circles. In the study of *Drosophila* it has been found that most deficiencies when present in homozygous condition are lethal, or death producing. According to Sturtevant and Beadle, "duplications in *Drosophila* has phenotypic effects more or less in proportion to their lengths. Short ones may have very slight effects. Longer ones have progressively stronger effects—usually a roughening of the eyes, changes in the shape of the wings, modifications of bristles."[12]

The detection of translocations in nature was made

[12]A. H. Sturtevant and G. W. Beadle, *An Introduction to Genetics*, p. 149.

possible through the demonstration of Belling [13] that circle formation at meiosis is due to translocations involving two or more chromosomes. Such changes have actually been seen cytologically in spontaneous as well as in induced translocations in *Datura,* in maize, in *Drosophila,* and in other organisms. Translocations are known in many plant "species" besides these two. Among plants in which these changes have occurred, Dobzhansky [14] lists peas, *Campanula,* onions, tulips, peonies, many grasses, spiderworts, and evening primroses. Very few such changes have been found in animals to date. In several "species" of seed plants it is found that wild populations may contain chromosome sets that differ from one another by one or more reciprocal translocations. It is also clear that related "species" sometimes differ in this respect, and that the phenomenon of translocation has been of importance in accomplishing diversity within groups.[15]

IX

If the genes were entirely as independent as they appear to be discrete units, it would make no difference if their arrangement in a chromosome were ABCDEF or ABCFED. But due to evident position effects, changes in the serial order of the genes are important in the development of variations from a normal form. Inversions can be detected by determining the order of the genes in the homozygote, but because of the laborious and time-consuming nature of this method, recourse is usually had to direct cytological detection or to another cytological

[13] J. Belling, "The Attachment of Chromosomes at the Reduction Division in Flowering Plants," *Journal of Genetics,* June, 1927, Vol. 18, No. 2, pp. 177-205.

[14] Theodosius Dobzhansky, *Genetics and the Origin of Species,* pp. 114, 115.

[15] A. H. Sturtevant and G. W. Beadle, *An Introduction to Genetics,* p. 172.

method in which search is made for chromatin bridges and accompanying fragments at the anaphase of the first meiotic division. Since the significance of the latter method was recognized, inversions have been recorded in great abundance in a variety of animal and plant material. It apparently is a much more widespread method of variation than translocation. Usually there is no appreciable reduction of the reproductive power of the individuals in which the inversion occurred.

A study of the morphology of metaphase chromosomes in different "species" reveals that structural changes may have occurred in innumerable cases. When this variation in morphology was first observed it was assumed that the "species" containing them had arisen through such changes as deficiency, duplication, inversion, and translocation. However, the discovery that cytologically visible difference in structure is due in some cases to the control of chromosome morphology by the genes, has thrown more or less uncertainty upon the value of such apparent differences in determining the possible origin of "species." Nevertheless, some situations appear to indicate that in *Datura* races exist which probably arose as translocations, because hybrids between such races show circles or chains of chromosomes at meiosis in addition to bivalents.[16]

Analogous conditions exist also in the hybrids between some "species." Circles, chains, and unequal bivalents are observed in hybrids between related "species" which have the same chromosome number or numbers differing in one or two elements and which are thus free from

[16]A. D. Bergner, S. Satina, and A. F. Blakeslee, "Prime Types in Datura," *Proceedings of the National Academy of Science,* January 15, 1933, Vol. 19, pp. 103-115.

suspicion of being related as polyploids.[17] Dobzhansky and Tan[18] have compared the gene arrangements in the *Drosophila pseudoobscura* and *D. miranda* chromosomes by examining their pairing in the salivary glands of hybrid larvae. The differences are so great that for the most part the synaptic mates fail to pair entirely, or else form extremely complex pairing configurations. Dobzhansky explains this as follows:

> "Some chromosome sections have been so thoroughly rebuilt by repeated inversions and translocations that their disc patterns in the salivary gland chromosomes no longer resemble each other, and no pairing of the homologous genes takes place." [19]

Although no such changes have been artificially produced, still there may be a possibility that the presence of chromosome changes of this kind in nature not only explains many of the physical differences between closely related "species," but also explains why these "species" fail to hybridize today.

X

In concluding this superficial treatment of the extremely interesting subject of hereditary changes in chromosomes, I wish to direct attention to one very outstanding fact in all this multiplicity of change which is occurring among organisms. Even if it be allowed that all these known processes of variation accomplish the greatest changes that investigators maintain they do, mutations in vinegar flies merely resulted in variously appearing flies. No one has ever conceived of the results as being

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[17] Theodosius Dobzhansky, *Genetics and the Origin of Species*, p. 138.
[18] *Ibid.*, pp. 144-147.
[19] *Ibid.*, p. 146.

anything other than vinegar flies. Autopolyploidy in spiderwort resulted in additional races or "species" of spiderwort. Allopolyploidy in the radish × cabbage hybrid merely resulted in a plant with a radish top and a cabbage root. Allopolyploids in marsh grass were additional races and "species" of marsh grass. Among animals tetraploidy in roundworms and brine shrimps merely produced new "species" of roundworms and shrimps. Heteroploidy in evening primroses merely produced races or varieties of primroses. Deletions and duplications merely produced waltzing mice from normal mice and notched-wing vinegar flies from normal vinegar flies. Translocations in Jimson weed and maize merely resulted in new varieties of Jimson weeds and maize. Inversions in lilies (*Fritillaria*) accomplished no more than to form new "species" of *Fritillaria,* while in squirrels it at most has done no more than result in a new "species" of squirrel.

After all these processes have achieved their greatest possible changes, we still have vinegar flies, spiderworts, radish × cabbage hybrid, marsh grass, primroses, roundworms, brine shrimps, maize, Jimson weeds, lilies, and squirrels. The crucial point lies right here: *each of these kinds is set off from every other kind by some "residual part" which no amount of gene change can erase.* Dobzhansky states that even between "species" "it must be admitted that in no case have all the differences between two good species been completely resolved into gene changes." [20] If this is true of *"species,"* what can be said of the differences which set off one *group* of "species" from another "species" group? Where the investigator

[20] *Ibid.*, p. 82.

keeps his eyes on the facts and forgets his pet theory, he must recognize that *no present-day natural process is capable of accomplishing the change necessary to build up the discontinuity between kinds now so widely evident in nature.*

As a study of fossil forms is made, it is easily recognized that any representatives of the large systematic groups are just as complex at their "earliest" appearance in the rocks as are their descendants today. This fact has been stressed by A. H. Clark [21] of the National Museum. Sequoia, beech, hazelnut, cottonwood, oak, willow, linden, and elm are just as distinct in the fossils as are their modern representatives. It is important to notice that the "species" of these fossil ancestors are occasionally not the same as our modern "species"; i. e., they are as different from our modern "species" as one of our modern "species" is from another of the same kind. The same holds among the animals. It was the recognition of this development under the operation of physicochemical laws working within the natural groups which made possible the sudden progress in biological research at the close of medieval times. Credit can be given to the concept of evolution here only as it directed attention to these processes of variation. The conclusion is that these present-day processes of change were just as active in the days of the schoolmen as they are today. The reader may assume as many millions of years since the formation of fossils as he likes, yet *all the processes of change have not accomplished, even in a single case, the erasure of the discontinuity which marks off the different kinds of organisms.*

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[21] A. H. Clark, *The New Evolution*, pp. 100, 101, 104, 105.

XI

The second assertion of the evolution theory as set forth by Dobzhansky reads, "The discontinuous variation observed at our time level—the gaps now existing between clusters of forms—have arisen gradually, so that if we could assemble all individuals which have ever inhabited the earth, a fairly continuous array of forms would emerge." [22] Those who have given the second edition of this author's book *Genetics and the Origin of Species* a careful reading will notice that after he very diligently considers all forms of change now known, he still finds no force in operation today which is of the quality to produce the present marked discontinuity. The greatest changes he has found are the mere production of additional modern "species" *within groups already clearly set off in nature.* The evolutionist is optimistic and has great faith in his theory. He commonly says, when presented with these difficulties, "Just give the processes time!" Such an attitude, however, is not reasonable, because natural laws do not change with passing millenniums. If we cannot lift ourselves by our bootstraps today, we could not do it in a million years. If processes of variation today are not erasing the differences between kinds, neither could they do it in one thousand million years.

From a study of such careful analyses of biological processes of change as Dobzhansky makes, it is evident that unwarranted faith in evolution is the only thing which will cause the evolutionist to stay by his theory of origins. How does the theory of special creation fare in the light of these facts? The creationist turns to Genesis and reads that each kind of plant and animal brings forth

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[22] Theodosius Dobzhansky, *Genetics and the Origin of Species*, p. 7.

"after his kind." He next turns to nature to see what Genesis means. He finds that even with all forces of change going full strength, still *vinegar flies continue to bring forth vinegar flies and maize continues to bring forth maize.* He finds in the fossil record *that this same discontinuity has existed since the earliest natural record.* All the work of all the geneticists is but verifying the Biblical record and explaining the differences in morphology which have come in since the origin of biological forms.

In the light of these facts it seems definitely unfortunate that evolutionists should say that the teachings of Genesis are obsolete and that the theory of special creation is held today only by the "ignorant, the dogmatic, and the prejudiced." The scientist says he abides by the facts. The creationist believes the evolutionist is sincere in this statement, but he is forced to conclude that his scientific colleague lets his faith in a theory greatly distort his interpretation of the facts.

Hybridization

I

SOME REFERENCE was made in the last chapter to the function of crossbreeding, or hybridization, in the production of variation. In view of what I believe to be its great importance, both imaginary and real, in the production of change among organisms, I wish to discuss the subject a little further in this chapter.

The term hybridization is used to designate both narrow crosses and wide crosses. The progeny of such narrow crosses as that of black guinea pigs with white guinea pigs and of tall garden peas with short garden peas are referred to in genetic literature as hybrids. The same word is used in referring to the results of crosses as wide as that between the radish and the cabbage, or between rye and wheat, or between the lion and the tiger, or between the swan and the goose.

The following statement made by the evolutionist Hurst is interesting in this connection. He refers to the importance of hybridization in the following words:

"One of the most remarkable proofs of the influence of crossbreeding in evolution lies in the extensive range of new varieties which have been produced by means of crossings and hybridizations in our domesticated animals and cultivated plants. Many changes here of course are due to mutations and transmutations, as in all organisms, but a great deal of the variety is due to new recombinations by crossbreeding and the careful selection of the progeny. Some authors do not consider these results to have any significance

in evolution, since most of them have been caused by man's intervention and human selection, but on the other hand they give definite proof of the capabilities of organisms to change in all directions, and one must realize that in many cases abnormalities and even monstrosities have been selected as more useful or fanciful for the breeder's purposes, while the more normal mutational changes have been discarded as not being of sufficient interest." [1]

In the reference which Hurst makes here to evolution, it should be observed that he is using the word to indicate the production of increased complexity through the origin of mere varieties within already established kinds and not to the appearance of new kinds from other kinds.

II

Hybridization has resulted in the origin of many interesting groups. Some evident cases of natural origin of new "species" were given in the last chapter. The fact that new modern "species" *are* being formed in our day is further established by the following four illustrations of new plant "species":

1. In 1881, Judge J. H. Logan of California introduced the loganberry, *Rubus loganobaccus,* as a cross between the red raspberry, *R. idaeus* or *R. idaeus strigosus,* and the blackberry, *R. allegheniensis.*[2] The loganberry breeds true with no segregation of blackberry and raspberry characters. Some claim this new berry was a variety of the dewberry, *R. canadensis,* and others that it is a hybrid between the dewberry and the red raspberry. The weight of opinion, however, is now for the red raspberry $\times$ blackberry cross. Regardless of which of these three possibilities is correct, it illustrates the results of hybridization. It is apparent that the loganberry is a

[1]C. C. Hurst, *The Mechanism of Creative Evolution,* p. 159.
[2]*Journal of Heredity,* November, 1916, Vol. 7, p. 504.

true modern "species" resulting from the hybridization and the duplication of the chromosomes.[3]

2. Pellew and Newton, in 1929, reported the appearance of a new "species" of primrose, *Primula kewensis,* at Kew, England, as the result of a spontaneous crossing of *P. verticillata* (eighteen chromosomes) and *P. floribunda* (eighteen chromosomes). The new and fertile "species" had double the number of chromosomes and the combined characters of both the parent "species." [4]

3. Goodspeed and Clausen, in 1925, produced a "species" of tobacco, *Nicotiana digluta* (seventy-two chromosomes), by crossing *N. glutinosa* (twenty-four chromosomes) with *N. tabacum* (forty-eight chromosomes). Since it has the attributes of a true "species" it has been given a specific name—*N. digluta.*[5]

4. A new pink-flowered horse chestnut, *Aesculus carnea,* was produced by crossing *A. pavia* (forty chromosomes) with *A. hippocastanum* (forty chromosomes). The hybrid, with a complement of eighty chromosomes, is fertile and commonly propagated from seeds.[6]

It is of great importance to observe the fact illustrated here that the most that hybridization can do in the matter of change is to give rise to another variety within some already existing kind. This is not evolution in the sense that evolutionists use it in their theory.

III

The search of past records for cases of hybridization is accompanied by much danger of deception. Even

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[3]C. C. Hurst, *The Mechanism of Creative Evolution,* pp. 166, 167.
[4]*Ibid.,* p. 135.
[5]*Ibid.*
[6]*Ibid.,* pp. 140, 141.

scientists whom we sometimes consider to be thickskinned and thereby immune to popular notions of their day because of their adherence to *facts,* have written untrustworthy accounts of many biological phenomena. Aristotle (384-322 B. C.), the Father of Biological Science, believed that aphids arose from dew, and fleas from putrefying matter. Sir Francis Bacon (1561-1626) believed in the production of perfect plants without seed from various kinds of earth. To him insects were "creatures bred of putrefaction," lice were "bred by sweat close kept," and fleas "principally of straw and mats, where there hath been little moisture." [7] William Harvey (1576-1657) associated himself with Aristotle in his belief regarding the origin of fleas and mosquitoes. Van Helmont (1577-1644) records that he *saw* rats arise new from a pile of bran and old rags. Maggots and flies were commonly believed by scientists of the first half of the seventeenth century to arise spontaneously from putrefying flesh.

Ronald Ross rebuked Sir Thomas Browne for his doubt of spontaneous generation, expressed in his *Enquiry Into Vulgar Errors,* published in 1662, in these words, "To question this is to question reason, sense, and experience. If he doubts of this, let him go to Egypt, and there he will find the fields swarming with mice, begot of the mud of Nylus, to the great calamity of the inhabitants." [8]

The older records of hybridization are likewise untrustworthy although sometimes attested by supposedly reputable scientists. The superstitions of the day repeatedly find their way into such literature. In his perfectly sober paper on *Hybridity in Animals and Plants,* read

[7] E. E. Stanford, *Man and the Living World,* p. 34.
[8] *Ibid.,* p. 35.

before the Academy of Natural Sciences of Philadelphia in 1846, reprinted in 1847, S. G. Morton fantastically records the production of offspring from a bull × sheep cross.[9] Every now and then rumors float around regarding a "common" sheep × pig cross in Mexico, but these are branded by the *Live Stock Journal*[10] as not authentic.

Another prevalent rumor is the assertion that cats and rabbits will cross. Representative of the statement of modern scientists on this point is the following:

> "Among mammals, it is usually impossible to obtain a hybrid by crossing one genus with another. Such wide crosses as the cat (*Felis domestica*) with the dog (*Canis familiaris*) or the jack rabbit (*Lepus californicus*) have never been obtained."[11]

It is a rather common notion, though definitely inaccurate, that the grapefruit originated as a cross between the grape and the lemon. Probably of the same nature is the report now in circulation that a new vegetable called a "wobbie" has been developed in Holland through a cross between a carrot and a beet.[12] Because of this maze of hearsay mixed with fact, the ascertainment from past records of what crosses have actually been made is nearly impossible.

IV

Another complication is the determination of whether the resulting embryo or offspring is because of the fusion of the egg nucleus and sperm nucleus, i. e., a hybrid, or whether it is merely a haploid development resulting from the instigation of segmentation through chemical stimula-

[9] S. G. Morton, *Hybridity in Animals and Plants*, p. 7.
[10] *Live Stock Journal*, January 16, 1931, p. 72.
[11] E. C. Colin, *Elements of Genetics*, p. 313.
[12] *Consumers' Guide*, November, 1943, back cover.

tion by the sperm. To illustrate, Loeb stated in 1912, "It is therefore possible to cross practically any marine teleost [bony fish] with any other," [13] and it is now known that the explanation here is that the phenomenon is merely a parthenogenetical development of the eggs through the activating influence of the foreign sperm. Similar cases have been observed in "crosses" of echinoderms × mollusks, and echinoderms × annelids. Cytological examination has shown that the entire sperm nucleus, in such instances, is thrown out of the egg at the first segmentation division. Centrifuging, treating with certain chemicals, or even merely pricking with a needle has accomplished the same sort of development.

I am of the opinion that the *union* of two gamete nuclei, regardless of the dissimilarity of the individuals from which they come and regardless of the fact that development may cease in early embryonic stages, is evidence that the parents are members of the same Genesis kind. This assumption is based upon the fact substantiated by all valid breeding data, that fertilization of the egg occurs only in individuals which are morphologically very similar and thus basically the same kind of organism. If this is true, it would seem that each Genesis kind is made up of a cluster of individuals (races, "species," "genera," or even families in some cases) which originally were characterized by the same peculiar chemical characteristics. Foreign sperms cannot accomplish fertilization, because of chemical incompatibility with the egg. Innumerable mutations and chromosome changes since creation would accomplish considerable reproductive isolation of groups within each original kind. Thus today

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[13]Jacques Loeb, *The Mechanistic Conception of Life*, p. 24.

we may even find sterility between races of the same "species."

Regarding hybridization, we read the following from the *Yearbook of Agriculture:*

"There is no way to tell in advance whether two distantly related organisms actually will cross. The attempt must be made, and sometimes it must be repeated many times. Most scientists are guided by the existing classification systems for plants and animals, and formerly there were many crosses they did not attempt because the organisms were too far apart in the classification system. They thought this made the cross impossible. This article mentions several hybrids that were produced only because someone was bold enough to make the attempt and to make it with sufficient numbers to get results. It is to be hoped that more and wider crosses will be tried in the future." [14]

As suggested in this quotation, the physiological "species" may extend over different taxonomic groups in entirely unexpected ways. In some few cases there may be little relation between genetical kinds and systematic groups. In the mind of the creationist a study of the former is the only way to gain an idea of what sorts of units are referred to in Genesis when the text states that organisms were made to reproduce after their kinds. To him the modern taxonomic series is merely a useful artificial tool in making himself intelligible to his colleagues when discussing organic forms.

One of the outstanding physiological characteristics of man is his inability to outcross with any other kind of animal; not even with the chimpanzee. On this matter the following statement by Colin is very much to the point:

"In ancient times various superstitious beliefs grew up around double monsters; some people even maintained that they were the hybrid offspring of man with some other mammal. As a matter of

[14] *Yearbook of Agriculture,* (United States Department of Agriculture), 1936, p. 183.

fact, there is no evidence of the origin of a hybrid between man and any other mammal." [15]

Most creationists assume that this is indicative that the other Genesis kinds were likewise physiologically isolated. The vast amount of hybridization and attempted hybridization reveals that only in cases where the parents are manifestly very similar plants or animals is crossing possible. This indicates to the creationist that hybridization may be a key to the present-day distribution of the created kinds. He knows that lack of the ability to cross proves nothing conclusively in the matter of kinds, because, as noted above, even races of the same "species" may be sterile *inter se*. But he does hold that any cases of hybridization, even though they terminate in death in early embryonic stages, are indicative that the parents must be members of the same Genesis kinds. The assumption is that in the original state all the members of the same kinds, corresponding to races possibly, were cross-fertile. The creationist holds that while all the evolutionist's research performed in an endeavor to discover whether evolution is occurring, is love's labor lost, yet hybridizing experiments are very much worth while because only in that way can those physiological units called Genesis kinds be even imperfectly delimited.

VI

The statement has been made several times above that the possibility exists that two groups of individuals may develop from the same stock and yet prove to be sterile when crossed. The question may well be asked, "Is there any basis in real fact for such a conclusion?"

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[15] E. C. Colin, *Elements of Genetics*, pp. 216, 217.

It will be noticed that I say that these forms "prove to be sterile when crossed." I am not referring to the sterility which develops from such physiological isolating mechanisms as (*a*) the failure of individuals to meet because of ecological isolation, i. e., they are confined to *different habitats* in the same region and therefore never come together—e. g., the different races of the malaria mosquito (*Anopheles*); (*b*) the failure to meet due to breeding periods' coming at *different times* of the year; and (*c*) psychological factors, such as differences in scents, courtship behavior, sexual recognition signs, etc.—e. g., the fact that various "species" of the "genus" *Canis* (dogs, wolves, jackals, coyotes) may have overlapping ranges and still rarely hybridize in nature. It is possible that mutational changes could cause any one of these particular physiological reasons for failure to cross. In this way varieties might arise from original kinds and constitute many of the modern "species" of our day.

The type of physiological change to which the above question refers is, however, that specific one which could split one strain off of the mother strain by causing chemical incompatibility with the ancestral group. Of course such a change would arise in a single individual, and several generations of inbreeding might have to follow before a pure strain of the changed form could appear.

A number of cases are on record where just such changes have apparently occurred. At least, complete cross-sterility or a large degree of sterility has appeared. G. A. Wiebe [16] describes two strains of barley which he studied in which the hybrids between them died in the seedling stage, while hybrids between either of these

[16] G. A. Wiebe, "Complementary Factors in Barley, Giving a Lethal Progeny," *Journal of Heredity*, July, 1934, Vol. 25, No. 7, pp. 273, 274.

strains and unrelated lines of barley were fully fertile.

Dobzhansky [17] describes the gene discovered by Hollingshead in *Crepis tectorum* (hawk's beard) which was not lethal in that "species" either when heterozygous or when homozygous, but which acted as a dominant semilethal in the *C. tectorum* × *C. capillaris* hybrids.

Both Dobzhansky [18] and Mayr [19] speak of the races A and B of the vinegar fly, *Drosophila pseudoobscura,* which produce when crossed semisterile daughters and completely sterile sons. Although these races are practically indistinguishable morphologically, they behave as good "species." The best explanation of this situation appears to be the occurrence of one or more mutations which have produced physiological differences as well as different ecological preferences.

Both Goldschmidt [20] and Mayr [21] refer to the titmouse (*Parus major*) rassenkreis [22] which occupies a C-shaped territory in Eurasia. The bird appears to have spread from Europe eastward in the north across Siberia and in the south across southern Asia. Subspecies are cross-fertile when living in juxtaposition in this arc, but where the two ends meet in eastern Asia the subspecies do not hybridize even though occupying the same territory. These workers refer to several similar situations. In speaking of *P. major,* Goldschmidt says, "We do not know what keeps them apart; but it might be a very small physiological or biological difference of the same order

[17] Theodosius Dobzhansky, *Genetics and the Origin of Species,* p. 283.
[18] *Ibid.,* pp. 307-314.
[19] Ernst Mayr, *Systematics and the Origin of Species,* p. 204.
[20] Richard Goldschmidt, *The Material Basis of Evolution,* pp. 120, 121.
[21] Ernst Mayr, *Systematics and the Origin of Species,* p. 182.
[22] "Racial circle," or large species, a term first employed by B. Rensch in 1929 to indicate a species which could be broken up into several geographical races. See B. Rensch, *Das Prinzip geographischer Rassenkreise und das Problem der Artbildung."*

as individual micromutational differences, whether geographical or local."[23] Whether the subspecies fail to breed or whether they are cross-sterile is not made clear.

Chromosome changes may likewise serve to cause cross-sterility among the members of the Genesis kind. Translocation, for example, is known to cause abortion of a part of the pollen and ovules. In some plants the resulting semisterility is used as a method for the detection of translocations.[24] Dobzhansky speaks of the new strain of *Drosophila melanogaster* produced by Kozhevnikov by combining two different translocations.[25] Kozhevnikov called this strain "*D. artificialis*" and found that it bred true when selfed and was sterile when crossed with *D. melanogaster*, from which it was made. In the preceding chapter reference was made to the possible function of polyploidy in the development of sterility between races of a single kind. Goldschmidt says of this, "But there is a phenomenon which occasionally produces isolation through chromosomal differences; namely, polyploidy."[26]

Thus it is seen that research in this field reveals a mechanism in nature whereby different groups of the same kind of organism may become cross-sterile. These data indicate that many of the "species" within present-day kinds, even though they may be cross-sterile, have possibly developed within the original kinds since creation. The scientific mind welcomes facts, but it is extremely important to recognize here that even though physiological discontinuity between groups may have developed, still this fact does not open the way for the evolution of new kinds

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[23]Richard Goldschmidt, *The Material Basis of Evolution*, p. 121.
[24]Theodosius Dobzhansky, *Genetics and the Origin of Species*, p. 299.
[25]*Ibid.*, pp. 302, 303.
[26]Richard Goldschmidt, *The Material Basis of Evolution*, p. 127.

from other kinds. The modern "species" which may have developed in this way are still just as clearly bona fide members of their kind as were the members of the group from which these new varieties or "species" sprang. To illustrate what I mean, the dog and the fox are almost universally sterile when crossed, yet this fact does not necessarily mean that they represent two separately created kinds, nor does it indicate that evolution of new kinds is occurring. Dogs and foxes are obviously members of a single kind. Whether one holds that they are originally created races of the original dog kind or whether he believes that they have developed since creation from certain other members of the dog kind is entirely a matter of personal interpretation.

VII

It has been the attitude of evolutionists and of some creationists that the discovery of isolating mechanisms in nature would be proof positive that evolution had occurred. Bateson declared that the proof of the development of this cross-sterility is the event "for which we wait." Some creationists feel that such a mechanism must not be recognized in nature. However, the scientist should never fear facts. If certain processes exist in nature, they should be recognized regardless of personal theories. The above data suggest that real proof *does* exist in support of the idea that cross-sterility *may* develop between closely related forms.

The danger here is not in the recognition of development of cross-sterility but rather in the personal interpretation of what this process can accomplish in the matter of variation. It is very clear that in all known cases where

such sterility has developed, the races or varieties which have been formed are *just as completely members of the single kind to which their ancestors belonged as were their ancestors.*

Let me attempt to clarify the situation which the facts here bear out by a homely illustration which is very faulty in most ways and yet one which may serve to make the case more clear. Suppose we have a peach pie before us. Will the fact that we may cut this pie into five pieces and isolate those pieces at the very greatest distances possible in the room cause some of them to change into cherry pie? Of course, I understand that evolutionists do not claim that it is the process of isolation which causes evolution but rather the processes of change which will operate in those groups after they are isolated.

The assumption of changes so great within an isolated group as to cause the erection of a new kind is a very interesting hypothesis, but there is not even *one* case in nature where changes in such groups have done more than develop an additional variety, race, or modern "species" of the ancestral kind. All processes of change appear to have their limitations, and those limitations are the general characteristics of the kind. The peculiar pattern of each kind is so extremely complex and persistent as to resist annihilation even at the hands of the combined effects of *all* the processes of change.

The evolutionist is unduly optimistic over the degree of change that can occur in the most mutable of kinds. He feels that even though it can be seriously doubted whether even a good "species" can originate from these processes today, still, just give these forces of change sufficient time, say a billion years, and changes *will* occur which will erect new kinds from other kinds. He tells us

that we in our short span of time are merely viewing a very small section of a moving picture, and that although the changes we view are usually small, yet those changes in a longer time will accomplish the erection of new kinds.

In making this statement the evolutionist fails in the same matter in which Darwin failed, that is, to recognize that we live in a law-bound universe. He does not recognize that natural forces have their limitations and do not change through the years. Gravity, for example, can do certain things, but it has its limitations. It is as reasonable for him to tell us that even though we cannot lift ourselves by our own bootstraps today, still, if we would just keep at it for a billion years we could, as to say that even though the forces of change in organisms are neither quantitatively nor qualitatively capable of producing new kinds today, in a billion years they could accomplish it. The law of action and reaction does not change as the ages roll. Neither do processes of variation in organisms. No one can explain all the differences between two original kinds of plants or animals; yet that these differences are very real and of such a nature as never to be eliminated through forces of change is witnessed by every work of research that has been conducted to test the nature of these processes. The best answer today to the question, "Why are two kinds of organisms so fundamentally different?" is possibly the same as that to the facetious question, "Why are the oceans so near their shores?" *They were made that way.*

VIII

There are authentic records to show that crossing has taken place at least to the extent of beginning of embryonic development between the following more

common animals: lion and tiger; horse, ass, zebra, kiang, and onager; dogs, wolves, jackals, coyotes, and some foxes; mouse and rat; sheep and goats; chicken and guinea fowl; chicken and turkey; ox, zebu, yak, bison, wisent, Brahman cattle, and Afrikander cattle; swan and goose; and house martin and barn swallow.

Hybrids among animals are frequent across gaps which may not appear so wide. Illustrations of this type of crossing are offered in the hybrids among "species" of ducks; among "species" of pigeons; among "species" of pheasants; between the purple and the bronzed grackles; between the red-shafted and the yellow-shafted flickers; among "species" of the Cecropia moth; among "species" of crows; between western and eastern "species" of the European hedgehog; among "species" of toads; between the house (English) sparrow and the willow sparrow; between some "species" of warblers; between several "species" of fresh-water fish; between some "species" of gall wasps; among rabbits and hares; among "species" of ibex; among "species" of coyotes; among "species" of caribou, etc.

Among plants some of the widest crosses for which we have authentic records are those of wheat with wheat grass, goat grass, boat grass, and rye; of corn with teosinte and gama grass; of radish with cabbage; of sugar cane with sorghum; of fescue grass and Italian rye grass; of wild tobacco and petunia; of bean and cow pea; and of blackberry and raspberry.

It is known that "species" within the following plant "genera" will cross with other "species" of the same "genera" and produce hybrids: alder, arbutus, basswood, birch, buckeye, canna, carnation, catalpa, catchfly, chestnut, cotton, currant and gooseberry, darnel, dogweed,

elm, evening primrose, fir, four-o'clock, goat grass, Hawk's-beard, hawthorne, hemlock, hickory, holly, honey locust, larch, lily, black locust, magnolia, maple, oak, oats, onion, papaw, pea, pine, poplar, poppy, rose, snapdragon, spiderwort, spruce, sycamore, timothy grass, tobacco, vetch, wheat, willow, and yew.

IX

It will be observed in all cases of crossbreeding that the individuals concerned in each cross always belong to the same large group, a group whose members are all bound together by fundamental similarities in morphology. For the theory which holds that Genesis kinds were smaller groups and that crossing of kinds was possible, it is indeed unfortunate that in all authentic cases of hybridization the hybridizing individuals are always obviously members of the same large group, such as the man kind or the cow kind or the dog kind or the bean kind. In the light of this fact, it seems much more logical to me to assume that even after many centuries, crossing still occurs only within the borders of the well-defined kind.

Perhaps I should not fail here to call attention to the fact that, viewed in a large way, there is usually a striking correlation between breeding performance and propinquity in our systematic catalogues. Even the radish and the cabbage belong to "genera" which lie in juxtaposition in our taxonomies. In other words, compatible physiological characters seem to be accompanied with similar morphological characters, but the converse is decidedly not always true. That is just the reason why our present-day systematic lists cannot always be taken as correct pictures of the actual blood relationships of organisms.

X

At the close of this chapter I shall give what I believe to be the most logical position for the creationist to take with regard to the crossing of Genesis kinds. The position I suggest is that Genesis kinds cannot and never could cross. Anyone who can present good reasons for holding to some other view of this matter is likely just as near the truth as I am.

Why should creationists believe that Genesis kinds could *not* cross? The first reason for holding this point of view is that, in my opinion, Genesis states that they could not hybridize. If it is true that organisms were created in such a way that they reproduced "after their kinds," then I believe that no crossing was possible. If crossing were possible, then each kind would not be reproducing after its kind. The creationist knows there was a man kind. Let him assume there was an ape kind. Now if a man were able to cross with a chimpanzee he would not be bringing forth after his kind, because the offspring would be neither man nor ape but something new.

It appears from the text that the Creator intended that each kind should continue as a distinct form down through succeeding time. If not, then why did He make them so that each brought forth after its kind? If He intended them to remain distinct, why then would He construct them in such a way that crossing could, and therefore probably would, occur? To me it has always seemed more reasonable for the creationist to assume that, in view of the Creator's obvious intention to keep the kinds separate, He must have made them with protoplasms which were physiologically incompatible.

A second reason for believing that original kinds could

not, and cannot, cross is the apparently unanimous testimony of nature that this is the very condition which exists today. The principal barrier in the way of laboratory demonstration of whether or not they can cross is our exceedingly sparse knowledge of bona fide Genesis kinds today. The only one that we are sure of is man. In various ways and for various reasons the germ cells of man have been mixed with those of more kinds than have those of any other animal! Even though this has been done, yet not a single authentic record of resulting offspring exists. This stands as real proof that in one case, the case of the only known Genesis kind, crossing with other kinds is always impossible.

A study of the reproductive behavior of other apparent kinds is largely guesswork, because the modern representatives of these original groups are not surely known. We read in Genesis 1 of kinds of grass and of herbs, and fruit-bearing trees. We read of kinds of "whales," of "fowls," and of "fish of the sea," of "cattle," and of "beasts of the earth," and of "creeping things." In Genesis 6 and 7 we read of sorts (or kinds) of "clean beasts" and of "beasts that are not clean."

It seems very sensible to assume that these Genesis kinds were the same groups that we commonly refer to as kinds today. Different kinds of animals are illustrated by men, apes, horses, cows, dogs, cats, rabbits, squirrels, chickens, and ducks. Among plants we recognize such kinds as wheat rust, typhoid bacilli, bluegrass, wheat, violets, spring beauties, oak trees, apple trees, and coconut palms.

In order to study today the reproductive behavior of other kinds than man, it is first necessary to select what we think is a kind. Here is where the trouble begins,

because no general agreement seems to exist as to what sort of group the kind was. For instance, suppose we assume that one of the original kinds was the horse kind. The question immediately arises, "Were the zebra and the ass members of the horse kind or did they with the horse constitute three discrete kinds?"

Faced with this question some creationists would inquire, "Are these animals cross-fertile?" They would seek to solve the problem in this way because from Genesis 1 they understand that the distinguishing character of the original kind was not a morphological one but rather a physiological one. The only characterization of the Genesis kind given us is that they brought forth "after their kinds." If this is the only character mentioned, it must be the most important one. In the light of this fact these creationists assume that any forms which are cross-fertile are constituents of a single Genesis kind. As explained above, it seems to them that if two different kinds were to cross, the offspring would not be after either kind but something quite new. Therefore, they believe cross-breeding is the only test of the original kinds which is available to us today. An application of this principle to the horses would lead them to conclude that our modern horses and asses are merely races or varieties of the original horse kind.

On the proposition that if Genesis kinds could cross, the hybrids would be members of neither of the kinds involved in the cross but would constitute a new group, or kind—if such were the actual performance in nature—then special creationists would have to agree with their evolutionist brethren that their main assumption is correct: new kinds of organisms would most certainly appear on the earth.

XII

The question has doubtless arisen in the reader's mind, "If all our modern horses are members of the same kind, how did they acquire such great chromosome differences as are found today between the horse (nineteen pairs) and the ass (thirty-three pairs)?" Permit me to amplify further my concept of the kind. If the horse and the ass were cross-sterile, I most assuredly would assume that, morphologically similar as they are, they might be members of two different kinds. Man and chimpanzees are strikingly similar morphologically and both have twenty-four pairs of chromosomes in each body cell, but they are members of two different kinds. In the matter of blood relationships, morphological characters apparently do not necessarily mean a thing.

My answer to the question in the last paragraph is, with regard to chromosome count, perhaps the horse and the ass were created just as they are today. In other words, I can conceive of original kinds which were so different from the man kind with his single form as to consist of several races. And the members of these several races may have had different chromosome counts—but they were always cross-fertile.

The question may well be asked, "But how could races with different chromosome counts be cross-fertile?" Even today the hardy mule bears testimony that a coalescence of races which have different chromosome counts can very successfully occur as far as the first filial generation. And that is not a reproductive dead end by any means. It is not uncommon today for fertile mules to be discovered even though mules experience limited breeding. A case is on record of a mule which on being bred to a stallion,

gave birth to a horse colt, and when bred to a jack, gave birth to a female mule colt (or may it not have been a female ass?).[27] An explanation here is that in the reduction division in the germ cells of this mule the nineteen horse chromosomes may have gone to one daughter cell while the thirty-three ass chromosomes went to the other. It may be that back when protoplasm was very possibly more virile, this was the mechanism which existed whereby the progeny of crossed races of different chromosome counts would revert back genetically pure to the original ancestral races.

It is my opinion that it is very possible that the man kind was the only sort in which all individuals were of a single race. Fossil remains of plants and animals indicate that at the beginning there was a great wealth of ecological niches, and that each of these niches had its peculiar plant and animal life. It is very possible that most of the kinds were represented in each of several different niches as ecological races of a single kind. A modern example of such distribution is found in the Florida cottontail rabbit, *Sylvilagus floridanius,* and the Carolina swamp rabbit, *S. palustris.* The former occupies open fields in Florida, while the latter stays in swampy woods and river bottoms in the same region. Hybrids of these two "species" have been known when these rabbits have been brought together unnaturally.

A second modern illustration of ecological races is found in two "species" of crayfish which inhabit the same region in southwestern Pennsylvania. One, *Cambarus monongalensis,* is confined to springs with clear water. The other, *C. diogenes,* lives in marshes and other stag-

[27]*Yearbook of Agriculture,* (United States Department of Agriculture), 1936, pp. 184, 185.

nant waters. In the Edenic state various kinds were possibly represented by numerous ecological races all around the earth. Most of the living representatives of these races have been dignified with "species" names today.

It is likewise possible that kinds also had their *geographical* races. Ecologists today designate this phenomenon "vicariation." To illustrate, the mammals of Eurasia and North America are said to "vicariate" on a large scale, where the European and American beaver, the red deer and wapiti, or elk, the European elk and the American moose, the reindeer and the caribou, the wisent and the American bison, and the European and the Canada lynx replace each other. I believe that these different "species" are really, in each case, merely races of original kinds, because each "species" is cross-fertile with its "vicar" on the other continent, i.e., the red deer with the elk, the wisent with the American bison, etc.

XIII

In a recapitulation of the facts considered in this chapter it may be said that along with the processes of change listed in the last two chapters, that of hybridization deserves an important place among those factors which produce variation among plants and animals. However, its limitations must be observed. The fact that crossing cannot occur across kinds, but is in each instance confined to the members of a single kind, makes it of no further service than to increase the complexity within separate kinds. Real facts show that isolating mechanisms in nature, in some way not understood as yet, never accomplish more than to increase the diversity within the kind.

Modern Species and the Genesis Kind

I

IT SEEMS VERY FITTING that a discussion of change in organic nature, in which reference is made to the origin of new "species," should be followed with a discussion of what is meant by the word "species." Different persons have what they think are very clear ideas of the composition of a "species." But the lack of uniformity in this individual conception of meaning is an unfortunate phenomenon which has added much vitriol to the published differences of opinion between evolutionists and special creationists.

It was not long ago that I saw in a religious magazine of wide circulation the bald statement, "No new species are being formed today." No explanation of the use of the word "species" accompanied the statement. Persons who have been educated in the primary, secondary, and higher schools of our country and who are evolutionists would conclude that the author of that sentence was either "ignorant," or "dogmatic," or "prejudiced." There is indeed a possibility that the author did not know that in modern scientific parlance the word "species" very commonly stands for the sort of group of organisms which *may* be formed today. With the evolutionists and creationists lined up in a threatening array, one side willing to fight for facts which are witnessed by their eyes (i. e., the

origin of new "species"), and the other side militant for a cause which they likewise believe is true (i. e., that new "species" *do not* arise today), let us call a temporary armistice and consider whether it is interpretation of *facts* in nature or *merely meaning of words* (i. e., definition of terms) which lies at the bottom of this nearly sanguinary misunderstanding.

II

It was the English botanist, John Ray (1627-1705), who first especially directed the attention of biologists to the unit in nature which he called a "species." The term had been used for at least eighteen centuries before his time but in extremely vague and confusing ways. In the minds of some workers it represented a large group of organisms, though in the minds of others it stood for only a limited group. Today we say of Ray that he was the first to introduce into natural history an *exact* conception of "species"; we wish that this were literally true. It would have saved about three centuries of misunderstanding among scientists and theologians.

Although Ray helped the taxonomic cause considerably by his clarification of the meaning of "species," still it was not until Linnaeus (1707-1778) appeared in the systematic picture that the idea of species began to find actual expression in tangible, practical form. Ray and Linnaeus both believed in the doctrine of special creation, and it is the personal interpretations of the theory by the latter which are saddled deliberately or unconsciously upon creationists of our day. In this connection there appear to be only two expressions made by Linnaeus which are remembered by evolutionists today. These are, first,

"Species tot sunt, quot formae ab initio creatae sunt"—there are just so many species as there were forms created in the beginning; and second, his oft-quoted remark, *"Nulla species nova"*—no new species.

In later editions of his *Systema Naturae* we find him receding from the position that species are fixed and constant and adopting the view that rather wide variation within the kinds had occurred and was still occurring. Strange to say, modern evolutionists do not recognize this change in opinion as a mark of honesty and of careful observation in Linnaeus, nor as evidence that he was not hopelessly dogmatic. Instead, remarkable to relate, they cite this change in his opinion with relation to fixity of "species" as proof that the theory of special creation was inadequate! It seldom seems to enter the minds of either evolutionists or special creationists that Linnaeus was possibly wrong in his decision with regard to what were the boundaries of the Genesis kinds. Let us not discard what may prove to be a perfectly good theory just because some one person's interpretation of it was inaccurate. Linnaeus read about the created kinds and then *attempted* to designate as *species* what *he thought* were Genesis kinds. That he drew his species lines around groups which *were often much too narrow* is apparent to anyone who wishes to look into his tenth edition of *Systema Naturae* (1758).

Genesis states that the "kind" brings forth "after his kind." In other words, the original kind was a physiologically compatible group, a genetical group, not necessarily a homogeneous morphological one. The distinguishing character of the kind was that it would always bring forth others like its own kind. Expressed in another way, any members of a kind could cross and the

product (hybrid) would also be according to the kind to which its parents belonged. To illustrate, races of the horse kind would, on crossing, produce horselike offspring; e. g., the ass × horse cross gives us the horselike hybrid which we call the mule. The truth of the Genesis statement, each "after his kind," is so obvious to us today that we commonly overlook it. We just take for granted that when we set duck eggs we will get ducks and when we cross dogs we will get dogs, without stopping to recall that this is the doctrine of Genesis.

III

An examination of Linnaeus' lists of "species" in *Systema Naturae* shows that he gave different species names; e. g., to the horse, *Equus caballus* L.; to the ass *Equus asinus* L.; and to the zebra, *Equus zebra* L. But many special creationists would differ from him here, because they do not believe that horses, asses, and zebras were different Genesis kinds. They recognize the fact very clearly that these three varieties of horses are perfectly valid modern "species." However, not only are they definitely horselike animals with many intergrading breeds, but they will cross rather freely and their offspring are by no means always sterile. Linnaeus also gave different species names to the rat, *Mus rattus* L., and to the mouse, *Mus musculus* L., although to many creationists they are obviously varieties of an original kind. These two good modern "species" will crossbreed, the hybrid embryos dying at an advanced stage.[1] He gave separate species names to the lion, *Felis leo* L., and to

[1]A. H. Sturtevant and G. W. Beadle, *An Introduction to Genetics*, p. 319.

the tiger, *Felis tigris* L., yet multitudes have enjoyed seeing the tiglon at the Central Park Zoo in New York which boasts a Siberian tiger father and a lioness mother. Surely these appear to be members of one kind of animal. He gave species names to the cow, *Bos taurus* L., to the American bison, *Bos bison* L., and to the yak, *Bos grunniens* L., as well as the European bison, *Bos bonasus* L., and to the Indian buffalo, *Bos bubalis* L. This would indicate that he considered them to be separately created kinds. However, hybridization experiments reveal that the common cow and the American bison cross quite freely, producing what is called the cattalo. Males of this hybrid are frequently sterile, and females, although fertile, frequently die at parturition, thus making the production of a cattalo herd a hazardous undertaking.[2] However, the possibility of membership of both of these in the cow kind of animal seems very likely. In the crossing of the cow "species" with the yak "species" (ox of central Asia), sterility is much less widespread. A hybrid with one-fourth yak blood makes a fair beef animal.[3] The hybrids of the American bison and the European bison, both Linnaean species, are completely fertile.[4]

It is difficult to follow Linnaeus' thought in his assignment of species names. These various breeds of cattle are obviously all one Genesis kind, yet he apparently considered them to be separate works of creation. In the case of sheep he assigned a single name, *Ovis aries* L., as a blanket term to cover all wild sheep. His type form here is not known. Why he should consider wild sheep

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[2]*Yearbook of Agriculture,* (United States Department of Agriculture), 1936, p. 186.

[3]*Ibid.*

[4]R. Hesse, W. C. Allee, and K. P. Schmidt, *Ecological Animal Geography,* p. 75.

to be all one created kind and wild cattle to consist of several separately created kinds is impossible to guess.

IV

This same unexplainable assignment of species names by Linnaeus is illustrated repeatedly in his naming of plants. For example, he gave separate species names to spring wheat, *Triticum aestivum* L., and winter wheat, *T. hybernum* L. Few agronomic writers, even among evolutionists, have recognized these forms as distinct "species." True, their differences are hereditary, but so are brown eyes and blue eyes. In addition to assigning species names to the two series of wheat already mentioned, he also gave species names to a diploid strain, *T. monococcum* L., to two of the tetraploid series, *T. turgidium* L. and *T. polonicum* L., and to the hexaploid strain *T. spelta* L.

Further investigation of his lists in the tenth edition of *Systema Naturae* reveals that he gave different *generic* names to wheat, *Triticum,* and to rye, *Secale.* Recent crossing of these two genera has been accomplished several times and this fact leads many creationists to assume that *Triticum* and *Secale* are at most merely varieties of a single original kind.

Within the genus *Elymus,* Linnaeus gave separate species names to three of our wild ryes, *E. caput-medusae* L., *E. canadensis* L., and *E. virginicus* L. It would be very difficult here to demonstrate the correctness of his judgment that Canada wild rye and Virginia wild rye were separately created Genesis kinds. Every indication leads to the more reasonable conclusion that these two "species" are merely varieties of an original kind.

V

I wish to make it very clear here that I am not saying that the species which Linnaeus named are not usually good, valid "species" today. The point I am stressing is the fact that, in the minds of many creationists, he was often too narrow in the delimitation of those groups of organisms which he thought constituted separate Genesis kinds.

Regardless of his unjustifiable assignment of species names, many creationists stand stiffly for the fundamental nature of the Linnaean species, apparently holding that Linnaeus had some advanced information, which no one has had before nor since his time, with regard to the scope of the Genesis kinds. An analysis of his naming of plants and animals shows that he was doubtless even less prepared to guess on the limits of the Genesis kinds than are the special creationists of today who have the advantage of much work in hybridization. The only thing which can be said for the Linnaean species is that it was generally more comprehensive than many of the modern "species" and thereby possibly of less practical value in the assignment of names to organisms.

The farther away we can get from any attempt to group animals and plants according to their actual blood relationships, probably the better it will be. This is true because neither Linnaeus nor any other taxonomist since his time has accurately understood which are components of a single Genesis kind. Our modern taxonomic system can make sense only when we understand that it is merely a convenient device for indicating similar or dissimilar morphology among organisms and does not necessarily give a picture of blood relationships. The Linnaean

species was too often a poor guess at such relationships from the point of view of special creation, and the modern morphological "species" is an even poorer guess at them from the evolutionary viewpoint.

VI

As stressed by Nordenskiöld,[5] Linnaeus' idea of species was essentially that of the Biblical "kind," i. e., genetic. He counted as many species as had been created in the beginning, or in later years, at any rate some species created in the dawn of time in respect of each genus, out of which the other "species" have since developed. This idea of species could very easily be reconciled with the idealistic idea of species which had existed since the days of Greek philosophy and which the biology of the romantic period preferred. In those days greater attention was paid to the idea expressed in the species form than to the question of origin. Darwinism brought the genetic idea of species once more to the public attention. To discover the origin of the different forms of life by a close comparison of their external and internal structure was, according to Gegenbaur, Haeckel, and their disciples, the end of biology. Thus a natural classification system was to be created with "species" based upon "true" relationships.

Nevertheless, this genetic idea of species rested upon an indispensable proviso; namely, that from resemblance one could positively conclude blood relationship; the greater and the more universal the resemblance, the closer the affinity. It is this foundation for the idea of "species" that modern genetic research has undermined. It has

[5] Erik Nordenskiöld, *The History of Biology*, pp. 206, 210-215.

clearly demonstrated that very close morphological resemblance can in cases be due to entirely different causes. It is not outward resemblance but the concurrence of hereditary factors that proves true relationship; that is to say, it is not phenotypical but genotypical resemblance that determines blood relationship. However, in all systematic works today the "species" are described entirely according to phenotypes because genotypic agreement can be learned only by experimental means. In practice, of course, this can take place only on a small scale. Under these circumstances it seems to be absolutely necessary to decide exactly what the categories of the system mark out. Unfortunately it has not been possible to obtain unanimity on this latter point. Whether a particular individual is a member of an already described "species" or a member of a new "species" depends largely upon the *opinion* of this or of that taxonomist.

This type of definition of a species is morphological and depends upon three elements. These elements have guided in the description and designation of most of the hundreds of thousands of modern "species." According to Rice, they are as follows: "First, the individuals of a species must show a considerable degree of similarity in a considerable number of characteristics. Secondly, although the extreme variation within a species may be considerable, there must be no conspicuous gaps; the extremes must be connected by a rather continuous series of intermediate gradations. Thirdly, one species may not grade into another, but must be bounded rather sharply in all directions." [0] These statements are at best rendered indefinite by frequent use of qualifying expressions.

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[0] E. L. Rice, *An Introduction to Biology*, p. 501.

This is necessary because of the absence of any standard for the degree of similarity requisite to mark off the lines of separation.

VII

The difficulty of defining a "species" is by no means imaginary. Rice has illustrated this in his comparison of Jordan's lists of North American (fresh-water) fishes. He states that in 1876 Jordan listed 670 "species." Twenty years later his list contained but 599. This is a net loss of seventy-one, although 125 new "species" had been discovered in the meantime.[7] A similar situation apparently exists among the birds, where it appears that a taxonomic housecleaning needs to be done. According to Mayr, the North American bird fauna, which is comparatively very well known, comprises 755 "species" and 1,367 races. He says that at least 94 of these "species," or 12½ per cent, might as well be considered races of certain of the remaining 661 "species."[8]

The following statement by Dobzhansky is pertinent here:

> "The notion, entertained by some biologists unfamiliar with the subject, that species are arbitrary units like all other systematic categories is unfounded. In fact, no category is arbitrary so long as its limits are made to coincide with those of discontinuously varying arrays of living forms. The category of species has certain attributes peculiar to itself that restrict the freedom of its usage, and consequently make it methodologically more valuable than the rest."[9]

This statement appears to negate what I have just said above, but harmony is seen if one bears in mind that

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[7] *Ibid.*, p. 502.

[8] Ernst Mayr, "Speciation Phenomena in Birds," *American Naturalist*, May-June, 1940, Vol. 74, No. 752, p. 260.

[9] Theodosius Dobzhansky, *Genetics and the Origin of Species*, p. 366.

Dobzhansky is speaking of the *physiological* "species," while I have been referring to the morphological "species." The latter *were* arbitrary, as is attested by the experience in the naming of the fishes of North America and by most other cases. Formerly, the morphological characters were the basis for "species" determination, and in such a system much depended upon the opinion of the taxonomist; that is, their delimitations were decidedly arbitrary.

It is of first importance to understand that the word "species" calls up unbelievably varied pictures in the minds of different individuals, depending upon their experience in the field of speciation and upon their point of view. In other words, by no means do all biologists speak the same language when they use the word "species." It is a modern example of confusion of tongues. Mayr says, "It may not be exaggeration if I say that there are probably as many species concepts as there are thinking systematists and students of speciation." [10] In the light of this confused state, it becomes apparent that the word cannot be used with general understanding unless it be accompanied by a careful explanation of the sense in which it is being employed.

VIII

Dobzhansky has listed a good many of the recent concepts of the "species." [11] However, all these concepts and the definitions that go with them have been classified by Mayr [12] into five groups. I will list these concepts and brief his discussion of them.

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[10]Ernst Mayr, *Systematics and the Origin of Species,* p. 115.
[11]Theodosius Dobzhansky, *Genetics and the Origin of Species,* pp. 372-374.
[12]Ernst Mayr, *Systematics and the Origin of Species,* pp. 115-122, 140.

1. *The practical species concept.* Those having this concept would define a species as follows: "A species is a systematic unit which is considered a species by a competent systematist (preferably a specialist of the group)." This is eminently practical for taxonomic routine work, and the element of judgment which it implies cannot be entirely ruled out of any "species" definition. On the other hand it cuts the Gordian knot and is therefore quite unsuitable in a more theoretical discussion of the origin of "species."

2. *The morphological species concept.* This is the concept of the old systematics and is even today the only practical one in all those groups which are still in the descriptive or cataloguing stage. It is the species concept with which Linnaeus started the science of systematics. The definition here would read as follows: "A species is a group of individuals or populations with the same or similar morphological characters." The trouble with such a definition is that it does not delimit true "species" from subspecies below or "genera" above. The most serious objection, however, is the fact that fertility and crossability vary to some extent independently of morphological characters, and the latter are thus of no use in the all-important borderline cases.

3. *Genetic species concept.* This concept is crystallized in Lotsy's definition published in 1918, "A species is a group of genetically identical individuals." We now know that not only all the subspecies are genetically different, but also the populations within the subspecies. In fact, except for identical twins, every individual in bisexually reproducing species is a different genotype.

4. *Species concept based on sterility.* If two animals produce fertile offspring, they usually belong to the same

"species," and vice versa, if such matings are sterile, they general belong to different "species." It is not surprising, therefore, that the criterion of fertility is part of many modern "species" definitions. "All forms belong to one species which can produce fertile hybrids." Unfortunately, this statement is not at all true, there being numerous cases known in which good "species" have freely produced completely fertile hybrids, and on the other hand a number of cases are known in which geographical races of one "species" exhibit reduced fertility or are completely sterile.

5. *The biological species definition.* This is the new concept of the "species" which has come in largely since 1935. As defined by Dobzhansky the "species" is "that stage of the evolutionary process at which the once actually or potentially interbreeding array of forms becomes segregated into two or more separate arrays which are physiologically incapable of interbreeding." According to Mayr, this is an excellent description of a "species" but not a definition. Stresemann defined it in these words, "Forms which have reached the species level have diverged physiologically to the extent that, as proven in nature, they can come together again without interbreeding."

Mayr defines the biological species as follows: "Species are groups of actually or potentially interbreeding natural populations, which are reproductively isolated from other such groups." It is his opinion that the races A and B of *Drosophila pseudoobscura* are perfectly good "species."

The most important aspect of the biological species definition is that it uses no artificial criteria, but decides each case on the basis of whether certain organisms behave

as if they were conspecific or not. Theoretically, Mayr feels it has fewer flaws than other definitions. In practice, however, it breaks down just as quickly as any others. Like them it is not applicable to isolated forms, and these are the really important ones. The application of a biological species definition is possible only in well-studied taxonomic groups, since it is based on a rather exact knowledge of geographical distribution and on the certainty of the absence of interbreeding with other similar species.

To these five different concepts of the "species," perhaps I should add a sixth, the *"Genesis kind species concept."* According to this concept the species is synonymous with the created kind. This is sometimes considered to be identical with the Linnaean species. But, as I have shown above, it is very possible that Linnaeus frequently gave species names to groups which were really mere variations of Genesis kinds. The only known illustration of such a "species" is *Homo sapiens.*

Suffice it to say, there are now two entirely different kinds of "species" in practical use, the old-fashioned Linnaean one (largely morphological) and the new synthetic polytypic "species" (largely biological) of a few modern taxonomists. It would appear to many creationists that this latest model "species" which in numerous cases possesses a great wealth of geographical races, many of which were formerly given "species" rank, may be a close approach to the original basic unit of creation. I might add that whether this basic unit was the original Genesis kind or merely an original race of an original kind will doubtless never be positively revealed to the scientist through his natural sources of information. It speaks well for the carefulness of the modern taxonomist's work, that his concept of

the basic unit of organization among organisms is coming around once more to what we believe must be the basic unit of creation.

IX

The modern use of the word "species" to indicate superficially distinguished groups of organisms which may differ one from the other by no greater character than three bristles more or less, has been rightfully protested by many evolutionistic and creationistic taxonomists. The creationists feel with good reason that they have been tricked. The old conception of the species was that it represented as large a group as the man kind, the horse kind, the oak kind, the sunflower kind, etc. If these groups were divided into several "species" the divisions were always large and roomy. Thus when the matter of origins was discussed and evolutionists said that new "species" had arisen from older, simpler "species" and the creationists maintained that all "species" were created groups, a common understanding existed between the two schools that they were talking about the origin of forms as diverse as black oaks and white oaks, and humans and chimpanzees. When Darwin was searching for the origin of "species," he was looking for the appearance of forms as different from one another as these just named. But as the years passed, the evolutionists began to use the word "species" in a narrower and still narrower sense until today in the lady beetles, for example, *species* and even *genera* are erected on differences no greater than exist among the various *races* of the single human species.

In our day the debate between evolutionists and creationists still proceeds, but a common understanding of

the terms used no longer exists. When he uses the word "species" the evolutionist now usually refers to small artificial groups such as the six "species" of coyotes in the United States, and in the light of many facts he feels justified in his conclusion that new "species" *are* arising today. The creationist, on the other hand, commonly still abides by the definition of species that was current *when the debate began.* Thus when the creationist says, "No new species are being formed today," the evolutionist, usually unaware of the shift that has occurred in *his own definition* of the term, promptly pronounces the creationist an ignoramus, or if he wishes to be a little less brutal he describes him as being "naïve."

In the light of this historical background, there is little wonder that creationists are adverse to the adoption of the recent abbreviated and superficial use of the word "species." Acceptance of this usage would be tantamount to admitting that they have been defending an unjustifiable position and that they now concede that new Genesis kinds *are* arising today. But of necessity the creationist must view the situation reasonably. In this matter of terms he senses a state of things quite similar to the one suggested by the old-time question, "Shall the mountain come to Mohammed or shall Mohammed go to the mountain?" The modern idea that a "species" is merely a superficial group which may arise here and there today within many different groups is fixed in the minds of the great majority of educated people, and it seems to many creationists that it is merely using common sense to fall in step with the modern usage. After all, the debate between evolutionists and creationists today does not involve "species," but rather it concerns the question, "Are new *kinds* arising today?" Those creationists who do

insist on holding to the broader meaning will find it necessary each time they use the word, to explain clearly just how it is being employed. On every occasion creationists will continue to make the matter very clear that the modern "species" is *not usually* the same sort of group of organisms as is the Genesis kind. The ultra-modern concept of a species recommended so highly by the evolutionist Mayr,[13] that it is frequently a polytypic group composed of several to many geographical races, apparently brings evolutionists and creationists back, very nearly at least, to a common understanding of the nature of the basic units among living forms.

X

In view of this confusing picture presented by the word "species," I suggested a short time ago[14] that it might be best for special creationists, when referring to Genesis kinds, to use an entirely new word compounded of the Hebrew words *bara* (created) and *min* (kind), baramin (pronounced ba rä′ min; plural baramins). If this word were used it could present but one idea in the mind of the reader; not the broad Linnaean species, nor his narrow one, nor the modern "species," but only the *Genesis kind.* As already mentioned, the only certain modern illustration of a baramin is that of *Homo sapiens.* The complete delimitation of any others is evidently impossible, owing to the physiological isolating mechanisms which have been operating within the baramins since creation.

The reference by Turesson to "bridgeless gaps" be-

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[13]*Ibid.*, p. 120.
[14]Frank L. Marsh, *Fundamental Biology,* p. 100.

tween most species,[15] the formenkreis of Kleinschmidt,[16] the rassenkreis of Rensch,[17] the statement by Anderson that "two species [of *Iris*] were made of two different materials," [18] the statement by J. Clausen in 1937 that "it has been shown, first of all, that species really do exist as natural biological entities," [19] the statement of Goldschmidt that "it is not difficult to show that between these [species] exist the 'bridgeless gaps' which we are discussing," [20] the statement of Dobzhansky that "the rank ascribed to a group has been changed repeatedly, and individual authorities are quite likely to be at odds in their opinion on such matters, but the delimitation of the groups is much less frequently a subject of contention," [21] the statement of Mayr that "in reality the species themselves are remarkably real natural phenomena," [22] and his description of the polytypic species composed of its geographical races,[23] are all more or less unconscious allusions to the existence in nature, camouflaged though they may be by mutations and chromosome changes, of the natural baramins of Genesis. The creationist believes that when biological scientists recognize these physiologically isolated groups, they will have discovered one of the most evident, and at the same time most important, facts in the world of living things.

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[15] G. Turesson, "The Genotypical Response of the Plant Species to the Habitat," *Hereditas*, 1922, Vol. 3, p. 343.

[16] O. Kleinschmidt, *The Formenkreis Theory and the Progress of the Organic World*.

[17] B. Rensch, *Das Prinzip geographischer Rassenkreise und das Problem der Artbildung*.

[18] E. Anderson, "The Species Problem in Iris," *Annals of the Missouri Botanical Garden*, 1936, Vol. 23, p. 471.

[19] Richard Goldschmidt, *The Material Basis of Evolution*, p. 144.

[20] *Ibid.*, p. 145.

[21] Theodosius Dobzhansky, *Genetics and the Origin of Species*, p. 365.

[22] Ernst Mayr, "Speciation Phenomena in Birds," *American Naturalist*, May-June, 1940, Vol. 74, No. 752, p. 257.

[23] Ernst Mayr, *Systematics and the Origin of Species*, pp. 123-146.

★ ★ ★ CHAPTER ELEVEN ★ ★ ★

Variation Since the Noachian Flood

I

THE STATEMENT of Agassiz, previously quoted, to the effect that blind cave fishes had been created blind and placed in the caves just that way, illustrates the extremely conservative position held by some creationists in the matter of variation since the Noachian flood. In this chapter I will consider in a brief manner this subject of *extent* of change. The theory of evolutionists most commonly assumes that living forms first appeared on this earth as one-celled organisms and that some of these simply constructed forms have gradually developed into the complex plants and animals of our day. Many creationists have decided that in the light of such an obviously false theory it would be safer to admit no change whatsoever. They apparently fear that if they admit any change at all they will be selling out to the theory of evolution. It would appear that the truth must lie somewhere between these two extreme views.

II

The creationist maintains that the only safe course to pursue in the search for truth in the natural world is the simultaneous study of the Scriptures and nature. The record of the Scriptures and that of nature mutually com-

plement each other because they have the same Author. What one may lack in detail the other may supply. No conclusion concerning fundamental biological facts should be reached until both records have been carefully examined.

In harmony with this philosophy, let us examine the Scriptural record to see if it may give us some key to the number of original kinds. In Genesis 1 and 2 we read that Adam was created on the sixth twenty-four-hour period of creation week. The order of creation on this Friday appears to have been first the formation of all dry-land animals, with the exception of the birds, which were made on Thursday, and then the making of man. It would not be profitable to speculate here whether Adam was made at nine or ten or eleven o'clock, for instance, but it does seem reasonable that part of the daylight portion of Friday was already gone before Adam appeared. It seems reasonable to assume that at least a little time elapsed after his creation before the animals were brought before him for naming.

In Genesis 2:19, 20, we read, "Out of the ground the Lord God formed every beast of the field, and every fowl of the air; and brought them unto Adam to see what he would call them. . . . And Adam gave names to all cattle, and to the fowl of the air, and to every beast of the field; but for Adam there was not found an helpmeet for him." It does not seem reasonable, in the face of this simple statement, to assume that Adam named only a few of the dry-land animals, nor that it took him longer than a part of the twelve-hour daylight portion of Friday. Those "creationists" who assume that each day of creation was a period of evolutionary time hundreds of thousands of years long have superabundance of time on their

"Friday" for Adam to name all the animals. But if it is assumed, as I do, that the record is literal, that the weekly cycle for this earth began with the first day of creation, and that Friday with its evening and morning was just the same as every Friday since then, Adam is left with but a few hours at most in which to name all the land animals.

According to Mayr [1] there are about 8,500 "species" of birds in the world today. If these "species" are Genesis kinds, if Adam could have looked them over and named one every five seconds, it would have taken more than eleven hours of his Friday time just to name the birds, not to mention hundreds of thousands of dry-land arthropods, mammals, reptiles, annelids, roundworms, flatworms, mollusks, etc.

Yet the account is that Adam named all dry-land animals on Friday, had time to feel lonesome, then was caused to fall asleep, and was afterward presented with Eve; and then this first human pair logically had time to get somewhat acquainted before sundown Friday evening.

Regardless of how we budget the daylight hours of Friday, there is but one possible conclusion regarding the number of original kinds of dry-land animals. They must have been, by comparison, very much less in number than our present-day modern "species."

III

The second item of presumptive evidence which has a bearing on the number of original kinds of dry-land animals is the dimensions of Noah's ark. Some maintain that we have no way of even guessing the size of the ark.

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[1] Ernst Mayr, *Systematics and the Origin of Species*, p. 202.

They suggest that a cubit at the time of the flood might be much larger than it was later. Even if this were true, the fossil record shows that all animals were just as much larger than those of today as man was larger than man is today. The end result would leave no extra room in the ark. I cannot agree with these individuals that the size of the ark is an entire mystery to us. The Lord saw fit to give in detail the dimensions of the ark, and to me it is absurd to hold that the value of the cubit used by Moses in describing this floating house was any other than that with which the Israelites were familiar. It is my opinion that the very largest structure possible would be about 515 feet long, 86 feet wide, and 52 feet high. Into this boat-house had to go enough food to last all occupants over a year, eight human beings and all the gear they would need or wished to carry over the flood, and two of each unclean dry-land beast and seven of each clean dry-land beast. There is no doubt that all these animals were larger than are their representatives today.

By reference to the list of clean and unclean beasts (Leviticus 11) it will be observed that unclean animals were usually the flesh eaters and the clean were always herbivorous. We may assume that God created them all "clean," at least they were all vegetarian.[2] The herbivorous, usually "clean," animals have always greatly outnumbered the carnivorous kinds. Thus we may assume that most of the animals present in the ark were there by sevens.

Some would have us believe that only animals of a limited area were present in the ark. There may be

[2]Genesis 1:30.

good reasons for this conclusion. Nevertheless, I believe that the simple story of chapters 6 and 7 of Genesis clearly portrays a world deluge which destroyed all land animals except those in the ark. Furthermore, I believe the strata of the earth today show beyond the shadow of a doubt that the flood was universal. Verses 13-16 of Genesis 7 state that every created kind of land animals found a place in the ark. Thus a second time the presumptive evidence points to the impossibility that all modern "species" today are Genesis kinds. If they were, where would space be found in the ark for seven individuals of most of the 8,500 "species" of birds, 14,464 "species" and subspecies of mammals,[3] 675,000 "species" of arthropods, plus reptiles, mollusks, annelids, flatworms, roundworms, etc.? Certainly the logical conclusion once more is that vast numbers of our modern "species" have arisen since the Noachian flood.

IV

A third item of presumptive evidence is described in Genesis 8:20 in these words, "Noah builded an altar unto the Lord; and took of every clean beast, and of every clean fowl, and offered burnt offerings on the altar." If these kinds were the same as our modern "species," it would be indeed a herculean task to offer one each of even all the *clean beasts.* (It should be borne in mind that included among the "clean beasts" of Leviticus 11 are the locust and the grasshopper after their kinds.) It seems to me that if it were possible to offer upon a single altar one each of all clean beasts in a period of time that

[3] A. J. Poole, *Journal of Mammalogy,* August, 1936, Vol. 17, No. 3, p. 282.

surely could not extend beyond a few hours, that fact is also indicative of the comparatively limited number of original kinds. To illustrate my meaning here, I would assume that Noah needed but to offer a single caribou, a type which was the ancestor of all modern caribou and reindeer, rather than consider that he found it necessary to offer *twelve* caribou in order to cover the "species" now found in North America alone, not to mention those now located in other parts of the world.

These paragraphs picture, in a brief manner, presumptive evidence which seems to me to indicate that the original kinds were, in the matter of numbers, a much smaller group than are the modern "species" on our taxonomic lists today. The conclusion I would draw from this evidence is that in many cases two or more "species" of today may have descended from a common ancestor.

V

Evidence of this same type is also available in the present-day geographical and ecological distribution of animals. An important point which Agassiz and other scientists who claim to accept the literal statements of the Bible apparently overlook is the fact that, after the flood, *all land animals disembarked from the ark* in the mountains of Ararat [4] in Armenia. In Genesis 7:21-23 we read, "All flesh died that moved upon the earth, both of fowl, and of cattle, and of beast, and of every creeping thing that creepeth upon the earth, and every man: all in whose nostrils was the breath of life, of all that was in the dry land, died. And every living substance was de-

[4]Genesis 8:4.

stroyed which was upon the face of the ground, both man, and cattle, and the creeping things, and the fowl of the heaven; and they were destroyed from the earth: and Noah only remained alive, and they that were with him in the ark." If this statement is to be taken as literally as it appears to me that it must be taken, then the ancestors of the koala bear of Australia came from Ararat; the forebears of the European bison, or wisent, came from Ararat; the ancestors of our American bison came from Ararat; the ancestors of the wingless kiwi of New Zealand came from Ararat; the forebears of the arctic fox of the Barren Grounds of North America came from Ararat; the progenitors of the rhea of Patagonia came from Ararat; the ancestors of the land snails of Hawaii came from Ararat; and the forebears of the moles which push up the sod in our own back yards came from Ararat!

A fair question is, "How did they get into their present niches?" One thing is very certain: when the ancestors of our red fox started from the ark they did not wait a few centuries until they reached our States area to reproduce. No, indeed! They reproduced all across Asia, and all the way down from Bering Isthmus, each generation probably pushing out a little farther. We find them today occupying the varying regions of our continent under the dignified titles of *nine distinct "species."* The red fox of Europe, with all its battery of perfectly "valid species," is very probably merely a descendant of the same group of progenitors, some of which traveled east and some west from Ararat.

The special creationist who maintains that most modern "species" are Genesis kinds has the task of explaining with regard to the red fox (*Vulpes*) how *V. alascensis* got all the way to Alaska without leaving any descendants

between there and Ararat. In a similar way he must explain how *V. cascadensis* got to California and why his kind is found nowhere else. The same applies to *V. macrourus* in the Rockies; to *V. regalis* in the northern plains; to *V. fulva* in northeastern United States; to *V. rubricosa* in Nova Scotia; and to *V. deletrix* in Newfoundland.

VI

And if we are puzzled over the origin of all our red foxes, what state of mind shall we fall into as we study the common meadow mouse, or vole, of North America? Did the manifestly blood-related "species" of this little pest cache their reproductive ability a few centuries until they selected some larger or smaller territory on our continent, or have they been extremely susceptible to the forces of variation to such an extent as to cause our taxonomists to go on a spree which did not collapse until our tiny varment was sliced up into three different "genera" containing seventy-six "species" and subspecies north of the Rio Grande? Did Noah have a spacious mouse department in his ark in which, among vast numbers of mice for all parts of the earth, were one hundred and fifty-two meadow voles labeled "For North America Only," and then did these seventy-six "species" and subspecies scamper all the way over here from Ararat holding their reproductive powers in abeyance so as not to populate any other regions with their "species" until they finally reached their own little corner on a small coastal strip in our Pacific northwest, or up in the mountains of Alberta, or down in Georgia? In consideration of the widespread hybridization within the group today, it seems much more logical to assume that they could all have come from a single

pair which debarked on Ararat. As this particular Genesis kind spread out over the earth it possibly left relatives all along the way from Ararat to its farthest point of distribution.

Some special creationists would say that the European wisent, *Bison bonasus,* was one Genesis kind, and the American bison, *B. bison,* is another original kind (Linnaeus so judged them). But in view of their cross-fertility and similar morphology is it not more reasonable to consider that in the dispersal from Ararat some of the ancestors of these animals went east and others west? Mutational changes under conditions of geographical isolation could accomplish the superficial changes seen in these "species" today.

The same could be said of such mammals as the European and the American beaver, the red deer of Europe and the American elk, the reindeer and the caribou, and the European and the Canada lynx. The similar physiological and morphological characters of these pairs are less indicative that they are separate Genesis kinds and more indicative that in each case they had a common ancestor in the ark.

VII

The geographical distribution of the woodland caribou, also called American reindeer, and its related forms presents an interesting study in the characteristic mosaic pattern of polytypic species.[5] Twelve "species" of this animal are scattered over the northern half of North America and its islands. Very likely the ancestors of

[5] H. E. Anthony, *Animals of America, Mammals of America,* pp. 26-34.

the eleven native "species" came into Alaska from Asia. Today we find Grant's caribou, *Rangifer granti,* in the Barren Grounds of the Alaska Peninsula. Spreading eastward across the Barren Grounds of North America is the Barren Ground caribou, *R. arcticus,* and still farther east and north are the Peary caribou, *R. pearyi,* in Ellesmere Land, and the Greenland caribou, *R. groenlandicus,* in Greenland. Spreading southward from Alaska is the mountain caribou, *R. montanus,* of British Columbia, the Osborn caribou, *R. osborni,* of the Cassiar Mountains in British Columbia, and the Alberta caribou, *R. fortidens,* of Alberta. Spreading eastward in the forested regions from British Columbia to Labrador, between Hudson Bay and the Great Lakes and south into Montana and Maine, is the woodland caribou, *R. caribou.* On Newfoundland island the Newfoundland caribou, *R. terraenovae,* is located, while still farther south, we find another "species," the Stone caribou, *R. stonei,* on the Kenai Peninsula. The Scandinavian reindeer, *R. tarandus,* has been introduced into Alaska and Labrador and is doing very well in its new home. Thus in North America alone we find twelve named "species" of caribou. Of these Anthony says, "There are many species of the Woodland group, but some are only slightly differentiated." [6] The clean-cut mosaic pattern of their distribution, with little or no overlapping of territory and with common fertility, indicates that all these "species" very possibly have come from a single ancestral type. If each of these "species" were an original kind, Noah would have found it necessary to provide room for eighty-four individuals of the American "species" alone.

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[6] *Ibid.,* p. 26.

VIII

It does not seem reasonable to me to assume that distribution from the ark was always unidirectional. Reproductive pressure in the original area would result in some individuals' pushing out in every possible direction in quest of food. Tapirs are found in only two places and these are on opposite sides of the globe, in South America and in the Dutch East Indies. The present situation of various "species" of ibex (*Capra*) appears to illustrate satisfactorily the fact of multidirectional dispersion. With Armenia as a starting point some traveled eastward and gave rise to *C. sibiraca* in Persia, Tibet, and the Himalayas; some went south and became *C. nubiana* in Sinai; some went south and west and became *C. walie* in Abyssinia; some traveled west and gave rise to *C. ibex* in the Alps; other individuals went still farther west and developed into *C. pyrenaica* in the Pyrenees; and still others went north and became *C. severtzowi* and *C. raddei* in the Caucasus. These are all perfectly good "species" today, but are also freely cross-fertile.[7]

IX

With the plants, postdiluvian distribution was an entirely different matter. True, there was doubtless a considerable number of plants which were carried through the flood in the form of seeds which composed a portion of the large store of food cached in the ark. But most of the vegetation sprang up here and there wherever propagules were able to survive the flood.

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[7] R. Hesse, W. C. Allee, and K. P. Schmidt, *Ecological Animal Geography*, p. 91.

From these centers of flood survival, plants have been and are still spreading out even into new continents. Here, as in the case of animals, lines of geographical races of polytypic species, often listed in our taxonomies as different "species," can be traced over the surface of the earth. Evidence in the form of hybridization data indicates that at least many of the "species" of a great number of our plant "genera" are merely variants of single kinds.

X

The fact that plants and animals, with the exception of a comparatively small number of cosmopolitan "species," are most commonly distributed over the earth in this mosaic fashion, with geographical races as the structural units, is one which cannot be emphasized too strongly.

This is the very pattern of variation in nature which became the turning point in the career of Charles Darwin. In his higher education, Darwin received two years of medical training at Edinburgh. Then he broke off his medical course and studied theology at Cambridge, from which he was graduated three years later. At that time, in the later 1820's, the theory of creationism was taught at Cambridge. When Darwin left the university he was an ultraconservative creationist, holding to the view that the "species" of his day had been created invariable and placed in the environments they then occupied. Later, on the five-year voyage around the world on the British cruiser *Beagle* with a mapping company, which he took soon after leaving Cambridge, he had an unusual opportunity to study the distribution of organisms. What he saw troubled him greatly. The actual existence of geographical races within most "species" did not suggest the

direct act of a Creator so much as dispersion from common centers with variation occurring among isolated groups. Finally, after pursuing the subject of variation for several years after he returned from his voyage, in a letter written in 1844 to his friend the botanist Hooker, he wrote:

> "I have read heaps of agricultural and horticultural books and have never ceased collecting facts. At last gleams of light have come, and I am almost convinced (quite contrary to the opinion I started with) that species are not (it is like confessing a murder) immutable." [8]

The extremely tragic thing for science was that Darwin, after finding that the facts of variation did not fit with the ultraconservative explanation of the theory of special creation, turned away from the theory entirely and plunged on to conclusions which were not at all justified by the facts. His weakness lay in his inability to observe that variation did *not* occur in an unlimited fashion. If he could have seen that the theory of creationism merely stated that the separate kinds could but remain separate, and that, with all the variation that occurs, nothing more is erected than additional races and varieties within the created kinds, he would have saved the scientific world its tragic pilgrimage into the delusion of unlimited variation leading to evolution of kinds, a delusion which still blows its confusing breath upon the scientific world of our day. Darwin's contribution to the great awakening in biological science was *not* his theory of evolution, but rather in his calling the attention of scientists to the fact that forces of variation and change *do* exist among living things. If he had held fast to the theory of creationism while recognizing these forces of change, he would have

[8] Erik Nordenskiold, *The History of Biology,* pp. 463, 464.

spared us the pathetic sight of our day as scientists spend their lifeblood searching vainly for missing links and for forces which will erect new kinds.

Many lessons can be learned from the experience of Darwin, and it is possible that not the least of these may be that of the damage which can be done in teaching a theory of special creation which is impossibly conservative. Such a narrow doctrine could distort the facts as much as does the theory of evolution.

XI

I have already recalled the fact above that all "species" are by no means polytypic, i. e., formed of many subspecies or geographical races. A very good example of such a "species," i. e., a monotypic one, is *Homo sapiens*. Most of our "genera" consist of "species" which are of limited distribution. The question at stake is, How many of the "species" are really different enough to merit a "species" name, and how many of them are really but geographical races of a widely distributed "species"? Mayr says:

> "A survey of the families and genera . . . of the New Guinea birds, if undertaken in 1850, would have resulted in the statement that only two per cent of the species are polytypic; the same survey repeated in 1941 shows that fully eighty per cent of the species are polytypic." [9]

A survey of North American mammals made in 1923 revealed that there are 2,554 named kinds of mammals on this continent.[10] Comparatively few polytypic species were recognized in this survey. This has the appearance

[9] Ernst Mayr, *Systematics and the Origin of Species*, p. 123.

[10] G. S. Miller, Jr., and J. W. Gridley, *Smithsonian Scientific Series*, Vol. 9, p. 241.

of a richly varied fauna, but when it is recalled that this list is made up of five "species" of cottontail rabbits, five "species" of Virginia deer, seven "species" of coyotes, eight "species" of chipmunks, nine "species" of red foxes, twelve "species" of caribou, fourteen "species" of pocket gophers, seventy-six "species" and subspecies of meadow mice, etc., we feel that after all as regards Genesis kinds, our mammalian fauna is nothing to boast of. And our present classification of these animals is much less to boast about. In view of the ready crossing among the "species" in many of our mammalian "genera" it would appear that we are sadly in need of the same kind of housecleaning here as was accomplished among the birds of New Guinea. Such a survey should greatly reduce our high percentage of monotypic "species."

Since many special creationists leave it to the evolutionary taxonomists to outline the "species" for them in order that they may vision the Genesis kinds, one wonders what these creationists will do when the recent trend in systematics begins to leave its mark on our lists of "species" and behold we have, for example, a *single* polytypic species of red foxes in America instead of nine monotypic "species." Will these creationists adapt themselves to the new biological species concept and reduce their estimate of the number of original kinds accordingly?

XII

It falls to the unhappy lot of any person who argues that good modern "species" are always Genesis kinds, to explain why Genesis kinds should travel in but one direction from the ark and establish themselves in the farthest corners of the continents and on islands of the ocean and

still leave no descendants along the land portions of the path to the present niche occupied by the "species." True, that appears to be just what has happened in some cases, e. g., the New Zealand kiwi. At least, all the seed he sowed by the way has died since he passed. Apparently this luckless, wingless bird could not outrun his natural enemies. But what about the wild dogs that ate the kiwi? Every country has its wild dogs, and they are cross-fertile—domestic dogs, wolves, coyotes, foxes, hyenas, jackals, and all.

Viewing this significant fact from another angle, let us recall the present-day complex mosaic of different "species" over the surface of the land masses. If the distribution from Ararat were other than unidirectional, and that is the only sensible conclusion in the light of the way distribution occurs today where expansion is possible in several directions, then why would we not find the selfsame "species" occupying similar niches all over the surface of the earth? How are we to understand the fact that the seven "species" of ibex *are* different? How are we to explain the fact that the wisent and the American bison *are* different? How are we to relate ourselves to the fact that the nine "species" of American red foxes *are* different? And what shall we do with the meadow mice? Should this be the case if modern "species" are as they came out of the ark?

Let special creationists not forget that all land animals came from the mountains of Ararat. Let them not become confused and say with the noted creationist Louis Agassiz, "Blind cave fishes were created blind and placed in the caves just that way." Agassiz read the first two chapters of Genesis, but strangely he ignored the facts recorded in the ninth chapter. We cannot do that and be

sincere and thorough in our search for truth. Likewise we cannot ignore the present mosaic of different animals which is spread over the surface of the earth. The fact that, except for a very few "species," every niche is occupied by a *different* modern "species," cries out to us that as the original kinds spread out over the uneven surface of a destroyed world, they left trails which can often be followed, not by lines of individuals of the same "species," but rather by more or less interrupted lines of different subspecies, "species," and "superspecies," which vary from one another because they have been acted upon by and have reacted to natural forces—forces which, according to all *known* facts, have repeatedly served to erect new variants *within* a kind, but which have never accomplished the origin of even *one new kind.* This is the most noticeable fact in all this variation, even though new "species" may arise as an organism migrates out from some center. The caribou remain caribou, the red foxes remain foxes, and even the meadow mouse in all its varieties is without the slightest question still a meadow mouse. New *kinds* of animals are never known to occur through this process of geographical isolation.

★ ★ ★ CHAPTER TWELVE ★ ★ ★

Significance of the Evidence From Classification and Morphology

I

IN DISCUSSIONS of the plausibility of organic evolution, evidence which is supposed to prove the theory to be a correct one is usually presented under the categories of classification, morphology, embryology, paleontology, geographical distribution, and genetics and experimental biology. In Chapters Seven and Eight we have already given brief consideration to the last of these divisions of the "evidence." In the last chapter we have given some consideration to the subject of geographical distribution. In those chapters we recognized that mutations and chromosomal changes *are* accomplishing *considerable* change in organic forms. We found that variation to the extent of the development of new "species" within the various kinds of plants and animals is very manifestly occurring.

However, we laid emphasis in these chapters upon a fact which the biological scientist commonly overlooks; namely, that this "evolution," or more properly, increased diversity in organisms, occurs *within* the separate kinds and *does not accomplish the erasure of the fundamental discontinuity so manifest in nature.* We found that the mechanics of genetics, whether in nature or in the experimental laboratory, have no natural forces or processes

which can accomplish the evolution of a new kind of animal. As logical as the evolution of one kind into another kind might appear to be, still, if we abide by the *facts,* we must recognize that not only is no shifting of one kind into another kind occurring, but also there is no natural mechanism in existence by which a change or series of changes great enough or of the right quality to accomplish this can occur.

In this chapter we shall briefly consider the "evidence" from classification and morphology. The study of change from the angle of genetics was a much more lively subject, because forces were at hand that were actually responsible for much of the variation in organisms. But the remainder of the categories listed in the paragraph above are less interesting because their weight largely falls in the direction of this theory or that, depending upon the point of view of the observer. In other words, this "evidence" is very largely subjective and, for that reason, quite unsatisfactory.

None of us would wish to be sentenced to life imprisonment or the electric chair on nothing but subjective evidence. The fact that I was present in a house at the time a murder was committed in it would not necessarily prove that I had any part in the murder. It might, it is true, but again it might not, and the real difference would be considerable. It is the consideration of this unsatisfactory quality in subjective evidence which makes the special creationist wonder why the evolutionist occupies so much space in his books with its presentation.

The evolutionist says that the fact that we find animals in nature grading in complexity of structure all the way from a one-celled, independent form at one extreme to a complex organism consisting of millions of cells at the

other extreme proves that evolution from a one-celled form to a multi-celled form has occurred. The special creationist says this multiplicity of form is the work of a Creator. Which one is correct? Both are very logical. The adherents of one theory can say, "It is" or "It does," and those of the other theory can say, "It isn't" or "It doesn't" until the sands of time run out and still no progress be seen. Such is the nature of subjective evidence. Imagine one each of the many kinds of animals set up in a line. From this static view, disregarding all mechanisms of change in nature, one theory is just as sensible as the other. Therefore, I say, how can we justify the filling of much space with this type of proof? The real test of the theory comes in a qualitative study of processes of change in order to find whether there is an actual occurrence of shift from one form to an entirely new one. These processes we have already weighed and found wanting (Chapters Seven and Eight) in the matter of origin of new *kinds*.

II

The evolutionist states that the classification system of Linnaeus, founded by a man who was opposed to the idea of evolution, results in "bringing forth some of the strongest evidence in favor of evolution." If this constitutes some of the "strongest evidence" [1] for evolution, then the special creationist must marvel at the faith of the evolutionist! In Linnaeus' day the biological sciences were in a sad state of confusion because no one worker could be sure to which organism his colleague was referring in his writing. One common system of naming was greatly

[1] Nathan Fasten, *Introduction to General Zoology*, p. 640.

needed. Linnaeus built such a system and placed it in the hands of zoologists and botanists. The Linnaean system, despite the efforts of the author to make it a natural system, was in fact an artificial system built to make the cataloguing of living forms more convenient. This system cleared away much of the confusion of the time and put a common language on biologists' tongues and at their finger tips.

Linnaeus' system was artificial in the sense that he was guided by external appearances in building his groups. A similar performance would be the cataloguing of the books in a library according to their size, or according to their color, i. e., red books here, green books there, and blue books over yonder. A natural system of classification of books would be their grouping according to subject matter. In biology, a natural classification would consist in placing more closely related animals or plants in the same groups. It would be a system of grouping which would reveal the actual kinship of living things. Linnaeus *thought* he was doing this, because in his mind members of the same "species" were blood descendants of the same Genesis kind. That he frequently missed his mark there is no question.

III

Since Linnaeus' time taxonomists have been making such changes as *they* thought necessary to bring supposedly related forms together. Although biologists in general feel that our modern system is largely a "natural" system, there is a very good chance that it, in fact, is nearly as artificial as was that of Linnaeus. Taxonomists have attempted to arrive at a truer picture by shifting from

superficial characters of structure to the use of fundamental morphological features of organisms discovered by a thoroughgoing study of their anatomy and embryology. However, the subjective nature of such evidence forever remains. It may be logical to assume that the presence of a notochord sometime during development indicates that the sea squirt is a closer relative of man than is the mollusk, which shows no notochord during development, but who can prove it? Is it not equally possible that a Creator could have made both the ascidian and the man, and because of such an origin they are in no way blood related?

The evolutionist answers by asking another question; "Well, suppose He did, what possible reason would a Creator have for forming them in such a way that the embryonic man and the adult sea squirt would both have notochords?" To this the creationist replies, "Who is man to attempt to assume why the Supreme Intelligence did this or that?" The evolutionist's question is absurd. Biology can only endeavor to find out the conditions under which notochords are developed and used, but never anything more. Those who question beyond that fail to fulfill Bacon's requirement that we should "ask nature fair questions." But the evolutionary taxonomist is continually putting such wrong questions to nature. The recently revived conception of the physiological rather than the morphological species is already making our present classification look more artificial than natural in many places. As previously stated, the sooner we use our classification system merely as a device to avoid confusion in naming the plants and animals, and cease to maintain that it is a picture of blood relationships, the sooner will systematists become honest, objective workers and not

mere speculators in a field which must remain largely subjective.

The special creationist accepts the fact that fundamental structural resemblance more often than not signifies genetic relationship. Generally, the degree of closeness of structural resemblance runs essentially parallel with closeness of kinship. Identical twins are probably the most nearly identical individuals, morphologically, that we know. But the assumption that structural resemblance *invariably* signifies blood relationship must always remain merely an assumption. The creationist maintains that the fact that every bone in man is also found in the higher apes does not prove the chimpanzee to be his near relative. It is subjective evidence of relationship, but that is far from conclusive to any others than those who wish to interpret it that way.

IV

One author, after directing attention to the recognized fact that closely related forms are morphologically similar, comes to the following strange conclusion:

> "It is only a short step in logic to conclude that two similar kinds or species of animal have been derived one from the other or both from a common ancestral species. Once having taken this step, we are on the road that leads inevitably to an evolutionary interpretation of natural groups. . . . It is logically impossible to draw the line at any level of organic classification and say that structural resemblance is the product of heredity up to such and such a level, but that beyond this arbitrarily chosen point heredity ceases to operate. . . .
>
> "Both special creationist and evolutionist find it equally necessary to assume the principle of heredity. . . . But let the reader beware at this point in the discussion, for if he admits the postulates already presented—and how can he help but admit them?—he cannot avoid the inevitable conclusion that the theory of descent

with modification is the only reasonable explanation of organic resemblance and difference." [2]

It is really remarkable to see what faith in a theory will do for a man. This writer is apparently sincere, but he does not stop to view the same picture from another very possible angle. He sees but one sensible explanation. The special creationist studies the very same phenomena and concludes that the only sensible view is that different kinds were created separately. He comes to this conclusion, because, although certain morphological structures do appear similar in many kinds, still a much more obvious phenomenon is the discontinuity between kinds. Each one is distinctly according to its own kind, and the evolution of such distinct groups could never occur from natural forces and processes now in operation. To assume that they have so originated is not sensible. This fact is objective and can be recognized by everyone, while the presence of similar structure in different kinds must ever remain merely subjective proof of evolution. A scientist can surely justifiably be considered sensible if he bases his conclusions on objective proof instead of subjective proof.

V

This inerasable discontinuity is not merely a present-day phenomenon. It has existed in just as great a degree ever since the "oldest" fossils were formed. Our attention has been called to this fact by A. H. Clark of the National Museum in the following words:

"One of the most striking and important facts which has been established through a study of the fossil animals is that from the

[2] H. H. Newman, *Evolution, Genetics, and Eugenics,* pp. 55, 56.

very earliest times, from the very first beginnings of the fossil record, the broader aspects of the animal life upon the earth have remained unchanged.

"When we examine a series of fossils of any age we may pick out one and say with confidence, 'This is a crustacean'—or a starfish, or a brachiopod, or an annelid, or any other type of creature as the case may be.

"In the details of their structure these fossils are not necessarily like the crustaceans, starfishes, brachiopods, annelids, or other creatures living in the present seas. Nevertheless, if they are sufficiently well preserved we have no difficulty in recognizing at once the group to which each and every fossil animal belongs.

"How do we recognize these fossils as members of the various groups? We are able to recognize them because they fall within the definition of a particular group. But the definitions of the phyla or major groups of animals are all drawn up on the basis of a study of their living representatives alone.

"Since all the fossils are determinable as members of their respective groups by the application of definitions of those groups drawn up from and based entirely on living types, and since none of these definitions of the phyla or major groups of animals need be in any way altered or expanded to include the fossils, it naturally follows that throughout the fossil record these major groups have remained essentially unchanged. This means that the interrelationships between them likewise have remained unchanged." [3]

If there is no real evidence, past nor present, that there ever was or is a continuous series of forms from the most simple to the most complex, then how can any scientist justify an assumption that all present forms have evolved from simple forms? Such an assumption may be logical (?), but it is not in keeping with the facts. Biological processes do not always occur in harmony with logic. The logic of evolution in our system of classification is definitely attractive if we deliberately ignore the fact of the type of discontinuity which we find to actually exist in nature. One biological fact is sufficient to upset an entire system of logic.

[3] A. H. Clark, *The New Evolution*, pp. 100, 101.

With this brief consideration of classification, we recognize the subjective nature of any evidence which is cited in this field as proof of this theory or that. Even though we recognize the presence of similar morphology, e. g., the notochord, in several groups of organisms, which might be interpreted as indicative of a common origin, still we must also recognize the fact of absence of connecting links, both between fossil groups and between living kinds. In the light of these facts in the field of taxonomy, it really appears that it is more sensible to assume that the ancestors of our modern groups were not evolved but created.

VI

It is coherent here to consider a little more fully the bearing of the subject of morphology upon the theories of evolution and special creation. Fasten declares that "morphology deals with the form and structure of organisms, and it affords some of the strongest evidence of organic evolution." [4] If this type of evidence constitutes "some of the strongest" arguments for evolution, then it is an unfortunate thing for the theory, because here again the evidence is entirely of a subjective nature and thereby susceptible of perfectly sensible interpretation from the angle of the evolutionist (?) and also of the creationist.

In great sections of the animal world we find common plans of organization. If the groups of metameric invertebrates are considered, namely, such animals as the earthworm, the centipede, the crayfish, and the insect, they are all reducible to the tube-within-tube type; when

[4] Nathan Fasten, *Introduction to General Zoology*, p. 640.

a skeleton is present it is of the exoskeletal type; and the central nervous system lies below the alimentary tract and is fundamentally of two parallel nerve cords with paired ganglionic masses at intervals which are bridged by connections giving a ladder appearance. All the vertebrates, from fish to man, have a dorsally located internal, jointed skeleton, the vertebral column traversed by a hollow spinal cord; all have a tubular digestive tract ventral to the nerve cord; all have organs of respiration in, or near, the throat region; all are metameric, a condition most conspicuous in the embryo; all except a very few forms have two pairs of limbs, similarly placed with reference to the main axis of the body; all have a brain in a skull; all have blood containing red cells; and all have the same general distribution of internal organs. Furthermore, each of the main organ systems of the vertebrate manifests the same fundamental structural plan regardless of the environment of the organism. To illustrate this, the hand and arm of man, the foreleg of the dog, hog, sheep, or horse, the foreleg of the frog, the wing of the bird or bat, and the flipper of the seal or of the whale are all fundamentally alike.

With regard to the morphology of man I will quote the following from the evolutionary zoologist M. F. Guyer:

"The comparative anatomist finds that physically man is bone for bone, muscle for muscle, nerve for nerve, in striking agreement with the higher apes. Man's method of bringing his young into the world and nourishing them is the same as theirs. In fact, each of the hundreds of interrelated parts which go to make up the complex anatomy of man has its counterpart in the manlike apes. His single disklike placenta, his thirty-two teeth, his taillessness, his broad, flat breastbone (sternum), the peculiarities of his vermiform appendix, his immunities from and susceptibilities to certain

diseases, and his blood tests clearly show him to be more nearly related to the anthropoid apes (gorilla, chimpanzee, orang, gibbon), known as the *Simiidae,* than to any of the other primates such as the Old World monkeys, . . . or the lemurs. . . . There are minor structural differences, to be sure, as there are between any two kinds of primates, but these are almost wholly differences in the relative proportions of parts and the minutiae of detail, not in the presence or absence of the parts themselves. Even the broader structural features of the brain correspond and bear the same names in anatomy. In fact, a practical guide intended for the dissection of the human body would serve very well for the dissection of one of the anthropoid apes. The differences are mainly such as fit man more perfectly to terrestrial as distinct from arboreal life. Thus he is more perfectly erect and completely bipedal. As befits the erect posture, the spine has four reversed curvatures (cervical, thoracic, lumbar, and sacral) and forms a sort of shock absorber for the centrally balanced skull; and the great toe, turned more to support, is no longer opposable. . . . His far superior brain development and the ability to reason associated with it, together with articulate speech, set man apart from the *Simiidae* more than do any of his other characteristics." [5]

It is these similarities of morphology which have aided in influencing the evolutionist to assume that animals have evolved from common ancestors. There is considerable in this field which can be explained quite logically from the viewpoint of development. In viewing all such data, however, the scientist must bear in mind that he is not seeing real proof. In all such study, he and the creationist are, as it were, sitting together at the side of a museum display case viewing static, dead material. The former says, "I believe this structural similarity indicates that these forms have all evolved from a common ancestor." The special creationist says, "I believe this constitutes very good evidence that these forms were all designed and created by one Supreme Intelligence." Which one has come to the correct conclusion? Certainly there is noth-

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[5] M. F. Guyer, *Animal Biology,* 3d ed., pp. 517, 518.

ing in this evidence to prove that either one is correct. The evidence is purely subjective and therefore of no value other than to be bent this way or that according to the theory of the individual using it.

VII

An important point which we often overlook when studying comparative anatomy is that anatomy alone does not constitute the animal. Whether we call this additional intangible something the personality of the animal or its "mental difference" from other animals, is of small moment just so long as we bear in mind that mere anatomy comes far short of indicating how much one kind of animal actually differs from another. The evolutionary zoologist A. H. Clark discusses this subject in a very worthwhile way in the first chapter of his book *The New Evolution*. I shall quote a few paragraphs of this discussion which have particular bearing on the relationships between man and ape.

"Man is a mammal, and it is indubitable that in his structure and anatomy man is very close to the manlike or anthropoid apes. This is an easily demonstrable fact which is quite beyond dispute. But a knowledge of the structure and anatomy of man is not sufficient in itself alone to enable us to judge of his true relations to the other forms of life and correctly to appraise his status in the world today.

"Unfortunately at the present time the broader viewpoint of man's relation to the world at large has among biologists been almost completely superseded by the very narrow viewpoint that the position of man is to be explained entirely on the basis of his dissected body.

"This narrow viewpoint has been developed in such a way and to such extremes as to lead to conclusions which in their total disregard of man as man cannot but give offense and arouse antagonism. . . .

"An animal is something more than the sum total of the organic

compounds, the secretions and the deposits that make up its body. There is something in addition to the tangible physical complex represented by its structure and anatomy.

"The bodily mechanism of every animal in life is operated and controlled by a mental mechanism which as yet we are unable to explain in terms of physics and of chemistry. In each sort and kind of animal this mental mechanism takes the form of a definite complex peculiar to the species. These mental complexes are as much a part of the individuality of each species as are the tangible structures of the body." [6]

Then after calling attention to the importance attached to mental traits in the consideration of the different breeds of dogs, Clark continues:

"How can we acknowledge the importance of the mental differences between the greyhounds and the hounds, between both of these and collies, and between all three and bulldogs, and then deny, or at least minimize, the importance of the mental differences between the orangs and the chimpanzees, between both and the gorillas, and between all three and man?

"To do this is to admit that the science of biology—the science that deals with living things—has crystallized into a narrow orthodoxy, a science of dead remains, a sort of common meeting ground of geology, chemistry, and physics, a science with no bearing upon those deeper problems which concern cosmic qualities and values." [7]

It is when we recognize the vast abyss that actually lies between kinds of organisms, whether we consider them as living individuals, as separate genetical entities, or as distinct kinds ever since their "earliest" appearance in the geological record, that it seems more reasonable for the creationist to assume that they appeared as separate acts of creation than for any to hold that they have ascended from a common ancestor through the operation of present-day natural laws which are incapable of producing changes of either the requisite quality or quantity.

[6] A. H. Clark, *The New Evolution*, pp. 2, 3.
[7] *Ibid.*, p. 4.

VIII

It is a not uncommon pastime for evolutionists to build up a mental pattern-map of morphologies which they assume a Creator would *have* to have in mind in order to create animals and plants. Having decided in their minds how the Creator would have to work, they then proceed to point out facts in nature which show that organisms are not built according to such a plan. These discrepancies between the postulated pattern-map and the record in nature are set forth as *proof* that animals and plants were not created. The least we can say about this procedure is that it is a strange business for serious-minded scientists. It reminds us of small boys building up a tottering wall of blocks and then gleefully throwing them down again to the supposed chagrin of some onlooker. If there is a Supreme Intelligence, it is not sensible to assume that a man, unless he be informed by the Creator, could possibly understand just what sort of detailed plan He had in mind when He made the first living forms. The time used in a discussion of such assumptions of details of plan is worse than wasted.

The following statements by a prominent zoologist of the last century illustrate what I mean here. In a discussion of homologous and analogous structures Romanes says:

"How then are we to explain these things? By design manifested in special creation, or by descent with adaptive modification? If it is said by design manifested in special creation, we must suppose that the Deity formed an archetypal plan of certain structures, and that He determined to adhere to this plan through all the modifications which those structures exhibit. But, if so, why is it that some structures are selected as typical and not others? Why should the vertebrae skeleton, for instance, be tortured into every conceivable variety of modification in order to subserve as great

a variety of functions; while another structure, such as the eye, is made in different subkingdoms on fundamentally different plans, nothwithstanding that it has throughout to perform the same function?"[8]

Then after building up this absurd assumption, after assigning it to the theory of special creation, and having torn it down again to his own satisfaction, he continues further:

"Consequently, special creationists must fall back upon another position and say, Well, but it may have pleased the Deity to form a certain number of ideal types, and never to have allowed the structures occurring in one type to appear in any of the others. We answer, Undoubtedly such may have been the case; but, if so, it is a most unfortunate thing for your theory, because the fact implies that the Deity has planned His types in such a way as to suggest the counter-theory of descent."[9]

The sad part about this pointless business is that the only American special creationist whom evolutionists appear to recognize *did* set forth just such ideas. The early American zoologist, Louis Agassiz, was never able to accept that idea of the transformation of species. During the same year that Darwin published his *Origin of Species* (1859), appeared Agassiz' famous "Essay on Classification." In this essay Agassiz, speaking of rudimentary organs, maintained that these exist not for any purpose of function, but to complete the design, just as in a building certain details are introduced for the sake of symmetry, without a practical purpose.

Here again, as pointed out in preceding chapters, evolutionists take one man's interpretation of the theory of special creation and play it up as if it were the first and last word of the theory. The basic points of the theory

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[8]G. J. Romanes, *Darwin and After Darwin,* Vol. 1, pp. 55, 57.
[9]*Ibid.,* p. 59.

of special creation are recorded in Genesis, and as anyone may see who wishes to read it, nothing is said there about any specific type forms or pattern designs. The creationist of today is in no manner disposed to let Agassiz explain the theory for him. Owing to the impossibility of deciding how the Creator planned the details of morphology, he is not at all willing to assume the details of any plan of procedure. The thing which amazes him in this matter is the way the evolutionists seize upon one man's interpretation of the theory of creationism and proceed to attempt to make the theory appear ridiculous merely because one adherent may have been shortsighted in his assumptions. This is a procedure that evolutionists would not countenance for a moment if their theory were concerned—nor should they. Any disinterested observer would doubtless suggest that the evolutionist and the special creationist abide by the rules of fair play in the discussion of their theories.

IX

The subject of "vestigial structures," the "rudimentary organs" referred to by Agassiz, has received a vast amount of attention in the discussional literature of theories of origins. With the fundamental homologies described briefly above, they constitute the bulk of evidence from morphology presented by evolutionists to prove that their theory of origins is correct. A "vestigial" structure is defined as a structure which corresponds in plan and position to functional parts of other "related" animals, but which is reduced in structure and may be without obvious function in its possessor.[10] Illustrative

[10] W. C. Curtis and M. J. Guthrie, *Textbook of General Zoology*, p. 568.

structures which are commonly represented as being vestigial are the splint bones in the feet of horses, the index finger of the bird's wing, the traces of the pelvic girdle and leg bones in some whales, the "functionless" eyes of many burrowing animals, the rudimentary pelvis and traces of limbs which occur in certain species of snakes, the tooth-germs in regions of embryo jaws which contain no teeth in the mature jaw, the collarbone of the embryo sheep which disappears as the embryo matures, and results in the adult's having no collarbone, the gill arches and gill clefts of embryos of higher vertebrates, and the wisdom teeth, the appendix, the fold of membrane in the inner corner of the eye, and the embryonic "tail" of man.

Many hundreds of these interesting structures are recognized in the morphology of animals. They compose a very heterogeneous lot and are particularly stimulating to the scientist when it comes to figuring out their history and possible function. Not many years ago the list was much longer than at the present time and included such vitally important structures as the thyroid gland. Great caution is necessary in determining whether a structure is or is not a "vestigial" one, for to so classify it, it must be demonstrated that the structure has *no* function either in the embryo or in the adult. Without doubt a number of those on even the short list which I have made above should be removed because they still have definite functions. But even with such questionable ones removed from the list, we yet have a number left which are without question truly vestigial in nature.

The pre-evolutionary explanation, illustrated later by Agassiz' opinion, was that each "species" of animal. though created separately, was nevertheless formed in accordance with an ideal type; hence the homologies. The

prevailing opinion was that animals originated in their present form and hence have not changed since their first appearance. But the special creationist of today reminds us that no such statement is found in the Bible. All that we are told there is that as each continues to descend through succeeding generations it remains true to its very general kind. The incompleteness of this Biblical record must be supplemented by a recourse to the present-day facts in nature. This observation of nature reveals no stereotyped adherence to one pattern in each case, but rather a delightful variation always resulting in changes which definitely cluster about the original general pattern of the kind, producing a group which has clearly defined boundary lines. The list of some of the mutations which have occurred in *Drosophila* which were listed in Chapter Seven is illustrative of how extreme these changes within the boundaries of the kind may be.

X

It is only in the mind of the evolutionist that the special creationist recognizes no such change in nature. Actually he recognizes every real change which the evolutionist recognizes, but after that he tries not to let his imagination get out of control and run away from the facts regarding changes to the extent of assuming that new kinds can be so formed. The creationist recognizes that in innumerable cases we have morphologies which are not as they were created.

An illustration of changed morphology is furnished in the blind cave animals. Agassiz' opinion that blind fishes were created blind and placed in the caves as we find them today is not the orthodox view of most special creationists. It is not orthodox for two reasons: first, the

Bible makes no statement that could lead one to think that no variation could occur; and, second, this opinion is contrary to natural facts. Eigenmann,[11] who studied cave animals for many years, found in general that blind cave fish develop what appear to be normal eyes in their embryonic history, but later lose them again through atrophy; different "species" have different parts affected. In all, however, the eye is reduced to a functionless structure more or less covered by skin. Since closely allied "species" with well-developed eyes always inhabit the neighborhood of the caves, whether they be in Indiana, Kentucky, Missouri, California, Florida, Cuba, or South America, the inevitable conclusion is that the blind "species" have sprung from the same ancestry as their free-living relatives. Their condition of blindness has resulted in their elimination from all environments except the caves. This ecological isolation has permitted them to change into present-day forms. The degeneration of the eye in these cases is very possibly the result of a single mutational change and the resulting structure is definitely a vestigial one. The creationist holds that such changes in the past history of animals may have been responsible for the large majority of such truly functionless structures.

After all the fuss and furor over vestigial structures has settled down, the question may very appropriately be asked the evolutionist, "Of what real value are such structures to your theory?" Evolution is a development of the more complex from the simple. Truly vestigial structures are subtractions, not additions. More important is the fact that after having removed from the list of vestigial structures all those which have any func-

[11] C. H. Eigenmann, *Cave Vertebrates of America.* (Reports of the Carnegie Institute of America, No. 104.)

tion in the embryo or adult, the remaining morphological additions may be made in any given case without affecting the kind to which the animal belongs. Let me illustrate this: Assume that man had a well-developed, functional third eye, appendix, wisdom teeth, ears that flapped, and even a tail. Would he thereby become transmuted into *another kind* of animal of simpler morphology? Would functional teeth or even hind flippers in an adult whalebone whale, functional wings in an apteryx, functional collarbone in a sheep, or more functional teeth in the jaws of other animals transform any one of them into some other kind of animal? I do not include such structures on the vestigial list as the gill arches in the embryo stage of man, because they are merely the beginnings of the structures which later develop from them, namely, axis of the lower jaw, two bones of the middle ear, styloid process, hyoid bone, stylo-hyoid ligament, and thyroid cartilage.[12]

XI

A study of classification and morphology in the light of these considerations thus reveals that in those situations where the evidence is not purely subjective, the theory of special creation offers a much more reasonable explanation than does that of evolution. With regard to those places where the evidence is subjective, of course the viewpoint of the observer determines whether or not an explanation is reasonable. Regardless of which evidence is studied, it is impossible to stay by the facts and conclude that one kind of organism has evolved from another kind.

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[12]M. F. Guyer, *Animal Biology,* p. 531.

★ ★ ★ CHAPTER THIRTEEN ★ ★ ★

Significance of the Evidence From Embryology and Physiology

I

AMONG THE EARLIEST facts to be recognized by biologists who studied the development of embryos was the similarity in form and external detail even in the cases of widely divergent "species" of animals. Equally obvious in embryos was the general conformity to a basic plan manifested by the various organs and organ systems. Before the beginning of the nineteenth century no special significance was attached to this similarity in appearance of embryos of separate kinds of animals, but beginning at that time, most notably among such outstanding biologists as Kielmeyer, Oken, Meckel, and Serres, was the opinion, couched in a crude manner, that each new individual in developing from the fertilized egg to the adult form lives over again in its morphology and physiology the evolutionary history of its race.

Just who was the first to hold to this opinion is not clear. Some even state that Aristotle had a very similar idea. As early as 1828, von Baer called attention to the fact that "the general of a large animal group expresses itself earlier in the embryo than the special." Von Baer himself, however, did not accept the doctrine of recapitulation which sprang up around such facts as he pointed

out. It was Fritz Müller (1821-1897) who in 1864 in a paper entitled "Für Darwin," gave to this theory its first clear and complete expression. To Müller the evolution of the "species" is a "historical document" displayed in the development of each new individual. This paper aroused the ardent enthusiasm of Haeckel (1834-1919), to whom it became a "biogenetic law," a "principle for the origin of life." Haeckel gave us the terse dictum, "ontogeny repeats phylogeny," and did more than any other in selling the opinion that this theory was a "fundamental biogenetic law."

Fifty years ago the "recapitulation theory" was well-nigh universally accepted by evolutionists. In the words of the evolutionary zoologist Guyer, "Like most plausible and striking theories, this theory was almost instantly and universally accepted by both thinking and unthinking biologists, and, especially by the latter, indiscriminatingly applied." [1] However, around this theory, also variously known as the "law of morphogenesis" (Hyatt), the "doctrine of parallelism" (Cope), the "morphogenetic theory" (Hatschek), and the "repetition theory" (Morgan), many controversies have raged. This is true because the interpretation of embryonic development as a source of evidence for genetic relationships is extremely difficult and affords many pitfalls for the unwary.

The uncertain nature of various aspects of the evidence is the cause of these innumerable controversies, many of which are still unsettled. That there is, nevertheless, still value in the theory as a theory to indicate possible evolution paths rather than to establish a "law," is the opinion of many evolutionists today. The words

[1] M. F. Guyer, *Animal Biology*, p. 533.

of Guyer, "Some zoologists repudiate the whole doctrine of recapitulation, but to most this looks like 'throwing out the baby with the bath water,' "[2] and the following statement by the evolutionary embryologist Huettner give a fairly accurate picture of the light in which it is viewed today: "As a 'law,' this principle has been questioned. It has been subjected to careful scrutiny and has been found wanting. There are too many exceptions to it. However, there is no doubt that it contains some truth and that it is of value to the student of embryology."[3]

II

In view of this conviction on the part of many scientists today that the embryo does at least in a sketchy and incomplete way indicate that evolution has occurred, I shall very briefly review the second of two scholarly papers on this subject by the creationist embryologist Cyril B. Courville.[4] In inquiring into the possible significance of the obvious roughly divergent parallelism of form and structure in the development of embryos, Doctor Courville presents seven postulates as the basis of his discussion. I shall follow his wording quite closely in summarizing this discussion.

1. The similarities in embryologic development (which constitutes the very basis of parallelism) in the passage of embryos from the simple to the complex can best be explained on the "logic of necessity." There is no other way for two separate and distinct species to

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[2] *Ibid.*

[3] A. F. Huettner, *Fundamentals of Comparative Embryology of the Vertebrates*, p. 48.

[4] C. B. Courville, "The Causal Significance of Parallelism: An Inquiry Into Certain Fundamental Principles of Embryonic Development," *The Bulletin of Deluge Geology and Related Sciences*, July, 1942, Vol. 2, No. 1, pp. 1-35.

develop when starting from a single cell and aiming for an ultimate goal in which similarities still exist, but to follow a somewhat parallel course. Reduced to a comparison of homologous structures, those which seem to favor the philosophy of evolution are likely to be selected as evidence supporting this concept. These comparable similarities have been frequently referred to as the "reminiscences (if not a 'history') of evolution." However, unless *all* the evidence of homology can thus be explained or otherwise accounted for, it cannot be used as proof to support any theory.

2. The parallelism of external form becomes more and more "divergent," while that of the internal organs and structures remains relatively "exact." To attempt to account for this phenomenon on the basis of evolution, it would be necessary to postulate a double influence in the process. The evolution of the viscera must have stopped, other than for minor details, very early in the process, while evolution of external form has gone on apace throughout presumed uncounted millions of years to result in a tremendous diversity of form and size. Why should this be so? Those who think this is explainable on the ground of the more variable external influence should recall that in many invertebrates a divergence of both external form and internal structure exists. Moreover, it would be necessary to prove that heredity has a more immediate and more persistent control over the internal organs than it does over external form, a theory which would be difficult to establish.

3. The various organ systems and organs are established on successful functional solutions of a given problem at various levels of complexity, but the fundamental plan is usually in evidence remarkably low in the animal

scale. If evolution were a hit-or-miss chance process and taking place simultaneously in many different places, it would be expected that a number of solutions of the various problems of function would have been attempted and evidences of these attempts should be found at least as "reminiscences" in the embryo if not in the fossil remains. It is significant that the embryo has failed to "reminisce" on any of the mistakes which evolution, if it occurred, must have made by the legion. Instead, nature provided a basic plan for the ingestion and absorption of food, for the circulation of the blood, for the excretion of waste products, for the transmission of nerve impulses, etc. There has been no evolution of this plan beyond a modification to suit individual differences. If one were to grant that evolution had taken place, he would also be compelled to admit that somehow the process was stopped when the best solution to the problem was reached.

4. In contrast to the general principle of parallelism in structure and function, another principle of the establishment of an early identity which preserves the individuality of each species presents itself. These individualities exist early in the embryo, far too early to be accounted for on the basis of ancestry. Similarities as well as differences cut across all ancestral lines to the disruption of carefully drawn phylogenetic trees.

5. In the construction of an identical organ, the embryos of even closely allied species use cells and tissues from various or different sources. This fact destroys the whole significance of homology, the last concept upon which the "reminiscences" of evolution are based. Moreover, without the aid of homology there is very little wood left to construct ancestral trees on any basis. It is obvious that the embryo gives evidences of an individuality, not

only of structures but also of the laws which control the development of that individuality. There is no evidence to the contrary, and there is certainly no reason not to believe that this individuality in the process of organ making has been transmitted indefinitely from parent to offspring. This is perhaps doubly significant since it is in the matter of organs that the theory of recapitulation finds its closest application.

6. Experimental embryology has shown that development is the result of a highly organized reaction of various potentialities inherent in the fertilized egg, which powers set about to reconstruct a new creature in a manner characteristic of the individual species. Experimental investigations have shown that eggs are to be classified on the speed with which they undergo cleavage and develop organ-forming substances; that while development is begun along such gradients, it is carried along by the presence of chemical organizers which set up a "hierarchy" controlling the development (as far as it can be traced) to considerable detail; and finally, that the function already begun in an organ plays an important part in its ultimate development. This last fact is very disturbing to any purely mechanistic view of embryology. What machine can assist in its own construction while in the process of operation? It has also been learned that deficits or imperfections in the embryo may be transmitted by heredity, but that additions cannot be so transmitted. An explanation of this new evidence in the light of evolution has not even been attempted by evolutionary philosophers to date.

Because attempts to account for the phenomena of development on the basis of causality have failed "since the decay of the evolution theory as a mode of explana-

tion," [5] one may be pardoned for making an attempt to see what there is to be learned from recent advances in this field viewed on the basis of some "wider category." In the first place, it is learned that tremendous inherent potentialities must exist in the embryo—powers which are supported, but not added to, by nutrition and respiration. These potentialities are sufficient to start in motion a machine which is not only capable of constructing itself, but also of keeping itself running meanwhile. These powers are manifest (experimentally) by the variable potentialities along the axial gradients, subsequently rearranged by the development of chemical organizers, and ultimately reinforced by the function of the embryo itself. These powers, as well as the structures resulting from them, cut across all evolutionary concepts which have been advanced thus far. They also suggest, by causal analogy, that not only the characteristics of the adult animal but also the very mechanism which produces it, are transmitted genetically from parent to offspring, and that these inherent qualities are to be traced back to some source which possessed them in the first place and started them on their course through history. The embryo has been able to gather nothing new unto itself. It is able to transmit only what it has, although it may be able temporarily to transmit defects due to injuries.

7. A study of the embryo indicates that its development occurs in accord with the universal principle of "least action." This law, proposed by the French mathematician and astronomer Maupertuis (1698-1759), states "that in all the changes which occur in the universe . . .

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[5] J. Needham, "Limiting Factors in the Advancement of Science as Observed in the History of Embryology," *Yale Journal of Biology and Medicine*, October, 1935, Vol. 18, p. 17.

that which is called the quantity 'action' is always the least possible amount." In other words, nature takes the shortest possible route in the accomplishment of her purposes. This principle, if truly universal, is fatal to the evolutionary concept of embryology. Organic evolution is quite the antithesis of this principle. If evolution is a fact, as many scientists aver, then nature cast all discretion to the wind in the making of man. Evolution completely denies the principle of "least action," and, if true, constitutes the solitary exception to the rule in the entire known realm of nature. It must have worked by laws not now existent.

This leaves the philosophy of evolution without any possible embryologic proof as far as known fact and laws are concerned. On the other hand, in so far as one can draw deductions from parallelism, the evidence supports the concept of special creation with the original placement in each animal of powers and potentialities which are characteristic and inherent within the individual and which have not been altered in transmission by any gradual process of change. By deduction, it may be reasonably assumed that the initiation of these processes was done in accord with the principle of "least action."

III

A fact frequently stressed by biologists is the apparent similarity between the protoplasms of plants and animals. In the light of this similarity in the fundamental substance of organisms, it is assumed by evolutionists that the first life on this earth was neither animal nor plant but a common one-celled ancestor of both. The phylogenetic tree representing the evolution of modern forms is represented with a single trunk at the bottom which divides

into the animal trunk and the plant trunk. Thus, it is represented to us that in the final analysis, not only are all animals blood related but, furthermore, all plants and animals had a common ancestor. A predominating character in reproduction of both plants and animals is for the new individual to develop from a cell (zygote) which has resulted from the union of the sperm and the egg. The morphology of the animal embryo at various stages of development is assumed to indicate the evolutionary path that that particular kind of animal has followed.

But strange to relate, nothing is ever said about the connotation of the changing morphology of the plant embryo as it develops from the zygote. The thoughtful scientist asks, "Why should the changing morphology of the animal embryo be considered so significant while that of the plant embryo is apparently without point? If one, in its development, crudely portrays its ancestors, why should not the same be true of the other?" This latter question would be particularly reasonable if all organisms had the same ancestor. The point here seems to be, if the new plant in its development from fertilized egg to adult clearly does not recapitulate its ancestry, why is it sensible to assume that the animal does? Again it would appear that the theory of special creation contains the more reasonable explanation of the two theories; i. e., that neither plant nor animal recapitulates its race history in its development from the fertilized egg to the adult.

IV

Turning briefly to the subject of the significance of evidence from physiology, here again we are considering material which is purely subjective in nature and, there-

fore, definitely unsatisfactory when it comes to proof for either theory of origins.

In recent years, with the development of rather highly refined techniques, it has been discovered that morphological similarities of animals are often quite strikingly paralleled by chemical and physiological resemblances. In one branch of this study, by means of the so-called "precipitin tests" a differential scale is established which is interpreted to indicate blood relationship. These conclusions are based on the assumption that similar chemical characters indicate similar blood relationships. The special creationist is extremely doubtful of the findings, however, because, as he maintains, we must bear in mind that blood is not a hereditary substance like chromatin. It is merely an assemblage of chemical substances as is protoplasm or even fingernails or claws. The presence of the chemical substances we call nails on the toes of birds and on the fingers and toes of man does not necessarily indicate a close blood relationship, even though the materials from both groups may be very similar chemically.

Scott has suggested the unreliability of such evidence in the following words:

> "It must not be supposed that there is any exact mathematical ratio between the degrees of relationship indicated by the blood tests and those which are shown by anatomical and paleontological evidence. Any supposition of the kind would be immediately negatived by the contrast between the blood of mammals and that of birds. It could hardly be maintained that an ostrich and a parrot are more nearly allied than a wolf and a hyena, and yet that would be the inference from the blood tests." [6]

Where the blood tester is permitted to select his cases

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[6] W. B. Scott, *The Theory of Evolution,* pp. 79, 80.

from those which do show chemical similarities which harmonize with our present classification system, and make no mention of the many instances where discrepancies exist, a fairly convincing array of "evidence" may be presented to the uninitiated. But this would be the same sort of technique employed so frequently in the presentation of evidence from embryology where the worker knows beforehand what he intends to find, then picks out the favorable material and ignores evidence equally valid but contrary to what he is looking for.

To the thoughtful scientist it seems unreasonable to select the precipitins from the group of antibodies and to stress their value as indicators of blood relationships, when the behavior of other members of the same antibody group are considered of no taxonomic significance whatsoever. By way of illustration, at least four distinct blood groups are found in man, namely, O, A, B, and AB. A mother of type A may give birth to a child having type B blood. Certainly, we cannot say that the child is not blood related to its mother. If in later years, however, an emergency should arise in which either the mother or the child was seriously in need of a blood transfusion, neither could give blood to the other because certain antibodies (agglutinins) in the blood of the recipient would agglutinate the red cells of the donor as fast as they came into the recipient's blood stream. Yet, even though these bloods are chemically different, we *know* the two individuals are blood related. Here is real proof that the bloods of two closely related individuals may be distinctly different chemically.

In another case, possibly the next child born to this same mother, the child may chance to have blood of type A, the same as its mother. Reciprocal transfusions may

be performed here with no untoward effects, because the bloods are identical chemically speaking. Here the individuals are closely blood related and have bloods which are chemically identical. Thus the same kind of antibody may indicate blood relationship or fail to indicate it, depending upon the specific case concerned.

In the light of these facts regarding agglutinins, why is it sensible to assume that another member of this same group of antibodies (a precipitin) should be any more reliable in indicating blood relationships? It might so indicate relationships and again it might not. The only real evidence we have here is that the precipitins are very possibly as unreliable as the agglutinins. In order to see any "verification" of taxonomy in this type of evidence, the jury must be bought off beforehand in the form of a theory that similar morphology indicates close blood relationship. Precipitins and agglutinins are both antibodies having certain points of similarity, as, for instance, their means of origin, their relation to heat, and, in some cases, their mode of operation. If we *know* agglutinins may show the bloods of mother and child to be chemically different (by agglutination) in one case and chemically similar (by no agglutination) in another, how can we safely assume that precipitins always indicate blood relationship when precipitation occurs?

The conclusion is again borne in upon us that in the various groups of evidence—whether in the field of classification, of morphology, of embryology, or of physiology—the subjective character is markedly prominent, but in any instances where real evidence is discoverable, it is always more sensible when considered in the light of separate kinds originating by separate acts of creation.

Viewed from another angle, that of the relation be-

tween chemical substances and morphological characters, it is surprising to the biologist that morphologically similar forms, whether blood related or not, differ as much as they do in the chemical nature of the blood and other circulating fluids. The morphological characters of any particular individual are largely determined by the timely presence of hormones in the blood. The genes themselves appear to be complex chemical substances. Similar genes result in similar morphological characters, while dissimilar ones produce morphological differences. In a general way we say that protoplasms are all alike. Added to this is the fact that plants and animals metabolize the same foodstuffs. It would be surprising if, with similar workshops, similar tools, and similar raw materials, other than relatively similar products were produced. Whether the chemical substances in organisms spring from the specific morphologies of the kinds or give rise to them, the fact ever remains that similar substances can never constitute real proof of blood relationship.

Significance of the Evidence From Paleontology

I

PALEONTOLOGY MEANS literally "science of ancient life" and deals primarily with fossils. Fossils may include such hard parts of animals as bones and shells, the soft parts having disappeared by decomposition; they may consist of petrifactions in which the organism has been replaced, particle by particle, by mineral matter, often with such minute completeness as to preserve even cellular details; they may be the preservation of original form only, thus giving us casts of the ancient plants and animals; they may consist of only the carbon of the organism, but with the original structure beautifully preserved; they may rarely be a preservation of the entire organism by freezing, examples of which are afforded by extinct "species" of the mammoths and rhinoceroses, the bodies of which, with flesh, hide, and hair intact, have been found in frozen soils in Siberia; or they may consist of preserved tracks of animals which were made in moderately soft mud or sandy mud which later hardened.

These fossils are dug up from the rocks of the earth's crust from poles to equator. Though now dead and unchanging, they were once living, growing organisms which were associated together in innumerable faunas, and were

adapted to all sorts of environmental conditions on the land and in the sea.

II

As early as the sixth century B. C., Xenophanes is said to have observed fossil shells and plants in the rocks of Paros and to have attributed their presence to incursions of sea water over the land.[1] The natural interpretation of fossils as organic remains of some sort seems to have gradually become general until the beginning of the Dark Ages. The schoolmen of the Middle Ages characteristically misinterpreted nature in direct disharmony with the Bible record, and the idea that fossils were merely "freaks of nature" having no historical significance persisted at least until 1696.[2] "With the Renaissance, however, and the growth of natural science, fossils again claimed attention and soon became the subject of a controversy that fully equaled in fanaticism and partisan bitterness the modern controversy over organic evolution."[3] When many devout Christians could no longer doubt the organic nature of fossils, a new idea, to the effect that fossils were the remains of animals overwhelmed in the flood, came to the fore that made this not merely acceptable but even a powerful support of the Bible. This new idea was carried to ridiculous extremes, however, by the ascription of such fossil remains as those of reptilian vertebrae, mastodon teeth, and whole giant salamanders to antediluvian men. One such investigator, after studying a large mastodon tooth, wrote in all pious seriousness:

[1] W. J. Miller, *An Introduction to Historical Geology*, 4th ed., p. 9.
[2] C. Schuchert and C. O. Dunbar, *A Textbook of Geology, Part II—Historical Geology*, 3d ed., pp. 19, 20.
[3] *Ibid.*

"I am perfectly of the opinion that the tooth will agree only to a human body, for whom the flood only could prepare a funeral; and without doubt he waded as long as he could keep his head above the clouds, but must at length be confounded with all other creatures and the new sediment after the flood gave him the depth we now find." [4]

The special creationist notes with regret that those who claimed to be interpreters of the theory at one time ignored the fossils as merely unexplainable sports of nature, and those who followed later accepted them as of organic origin but taught manifestly impossible theories concerning them. It is such inaccurate positions as these that characterize creationists in the minds of the evolutionists. It is important, however, in the reading of all these records that the reader bear in mind that none of these extreme views of special creation are taught in the Bible. They arose purely in the imaginations of those who claimed to be creationists. The pure theory of special creation has remained unchanged since it was penned many, many centuries ago, while many of those who asserted that they were creationists have swung from one impossible extreme to the other. The special creationist of today accepts the pure theory of creation which requires a constant comparison of Biblical statement and natural fact in order correctly to understand natural phenomena.

III

The rock masses composing the portion of the earth's structure which we can examine are of two general types, the stratified (sedimentary layers) and the unstratified (crystalline complex of igneous rocks and metamorphosed

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[4] *Ibid.*, p. 21.

strata). The latter group of crystalline rocks are usually without fossils, and they appear to form the framework of the earth, for in every known case they lie below the sedimentary rocks. This framework comes to the surface in many cases, for example, the 2,000,000 square mile outcrop around Hudson Bay, the vast central plateau of Africa, and much of the great mountain ranges of the Himalayas, the Altai, and the Andes. In other places the crystalline rocks are covered by sedimentary, fossil-containing rocks which vary in thickness from total absence, as just stated, to between two and three miles, with an average thickness of less than one mile. The surface of our earth thus presents much the appearance of a crazy quilt with one type of rock at the surface here and another over there. Any one "block" may vary in size from a few square yards to several millions of square miles.

This actual structure of the surface layers of the earth is greatly in contrast with the theory of its structure set forth by the German mineralogist A. G. Werner (1750-1817). He taught what has since been called the "onion-coat" theory, in which he assumed that the earth had been built up by the addition of five different mineral layers added one on the outside of the other until the earth reached its present diameter. That the earth is not so formed of concentric mineral layers has been disproved by geologists long ago. It is common knowledge that a stratum of rock "which is 1,000 feet thick in one locality may in the course of a few miles become only ten feet in thickness, or may run out altogether; or it may change from sandstone to limestone or shale; or if the first part of it contains Devonian fossils, it may change to a bed containing Silurian or Carboniferous ones. Often a bed of coral limestone, for instance, thins out at

short intervals, being in mere isolated pieces 100 feet or 1,000 feet or so in length, called lenticular masses, sandstone or shale occupying the space between." [5]

However, geologists merely shifted from the assumption of mineral onion coats to one of fossil onion coats. The English geologist William Smith (1769-1839), who has been called by the English the "Father of Historical Geology," was apparently the first to conceive of the idea that fossils were of significant value for determining the relative age of stratified rocks. This assumption has continually strengthened in the minds of geologists until in recent times, probably because of the great convenience of the method, the age of rock formations is determined, cases without number, by "index" fossil content only. "For example, in 1902 a dozen specimens of fossils were brought back from the Antarctic Continent. Among them were some ammonites . . . which are considered index fossils for the Cretaceous period. Accordingly, the Antarctic surface formation was classified as Cretaceous, and it was affirmed that it was laid down at the same time as Cretaceous rocks in other parts of the world." [6]

The following two statements by recognized authorities in geology are very much to the point here:

"The primary divisions of the geological time-scale are, as we have just seen, based on the changes in life, with the result that fossils alone determine whether a formation belongs to one or the other of these great divisions." [7]

"These systems, although actually arbitrary groupings of the stratified rocks of particular regions, have come into common use as the primary divisions of the rocks whenever chronological sequence is considered. In describing any newly discovered fossilif-

[5] George McCready Price, *The New Geology*, p. 82.
[6] W. J. Tinkle, *Fundamentals of Zoology*, pp. 417, 418.
[7] A. W. Grabau, *Principles of Stratigraphy*, p. 1103.

erous strata in any part of the earth, the first step to be taken, in giving them a scientific definition, is to assign them to one or other of these systems upon evidence of the fossils found in them. The character of the rocks themselves, their composition, or their mineral contents have nothing to do with settling the question as to the particular system to which the new rocks belong. The fossils alone are the means of correlation." [8]

IV

The justification of this procedure of determining the age of rocks by their fossil content is highly interesting. I shall illustrate it by quoting from three authorities:

"Since the first introduction of life on the globe it has gone on advancing, diversifying, and continually rising to higher and higher planes. . . . Accepting, then, the undoubted fact of the universal change in the character of the organic beings which have successively lived on the earth, it follows that rocks which have been formed in widely separated periods of time will contain markedly different fossils, while those which were laid down more or less contemporaneously will have similar fossils. This principle enables us to compare and correlate rocks from all the continents and, in a general way, to arrange the events of the earth's history in chronological order." [9]

"It is a well-established fact that, as geological time went on, both plants and animals gradually evolved and, as a rule, became more and more complex in their organization. Single-celled plants lived in Archeozoic time. Even as far along in geologic time as the early Paleozoic era there were no land plants and only invertebrate animals, mostly of low-order types. By middle Paleozoic time seedless land plants and low-order seed-bearing plants, including certain types of trees, appeared. About the same time low forms of vertebrates, such as primitive fishes, had been evolved. In the later Paleozoic, amphibians evolved from fishes, and reptiles from

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[8] H. S. Williams, *Geological Biology*, pp. 37, 38. Other statements concerning the use and importance of the fossils in determining the chronology of rock formations may be found in W. J. Miller, *Introduction to Historical Geology*, 4th ed., pp. 9-13; C. Schuchert and C. O. Dunbar, *Textbook of Geology, Part II—Historical Geology*, pp. 24, 25, 29, 68, 69; A. W. Grabau, *A Textbook of Geology, Part II—Historical Geology*, pp. 31, 32, 53.

[9] W. B. Scott, *An Introduction to Geology*, pp. 347, 348.

the amphibians. During Mesozoic time reptiles dominated animal life, and birds and mammals evolved from the reptiles." [10]

"The evolution of life has been continuous though very slow. The resultant succession of faunas gives us a basis of chronology, although if the record of life were complete it would not necessarily form a basis for the natural subdivision of the record. In fact, however, the fossil record does afford our best direct means of evaluating the breaks in the record and of classifying the formations." [11]

"Since each formation has distinctive fossils by which it can be recognized from place to place, it is possible by the extension of the kind of investigation suggested above to piece together the record and build up a complete chronology for a large region.

"In this reasoning only one assumption is involved, namely, that the rocks of a given age have fossils distinctive of that time and different from those of any other age. If that be granted, and it must be from the acquired knowledge, it is possible to correlate rocks of the same age from place to place over the Earth and thereby to determine the true sequence of events everywhere that fossiliferous rocks occur. Upon this principle much of the whole science of Earth history rests." [12]

V

As remarked already, this justification for the determination of the age of rocks by their fossil content is extremely interesting, even though it cannot be defended either from logic or from fact. Although Werner's "onion-coat" theory of mineral layers was discarded, still the very absurdity for which it was discarded is continued in the method of determining age by fossils, namely, the *universality of one kind of deposit.* It merely restated this theory in terms of fossils, instead of in terms of mineralogy and mechanical texture.[13] Herbert

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[10]W. J. Miller, *An Introduction to Historical Geology,* 4th ed., p. 13.

[11]C. Schuchert and C. O. Dunbar, *A Textbook of Geology, Part II—Historical Geology,* p. 68.

[12]*Ibid.,* p. 24.

[13]George McCready Price, *The New Geology,* p. 595.

Spencer, seeing this, declared that "though the onion-coat hypothesis is dead, its spirit is traceable under a transcendental form even in the conclusions of its antagonists." [14]

If the fossil strata of the earth were laid down concentrically so that each layer passed entirely around the globe, there could be no question as to which one was the oldest. Under such an arrangement the sequence of geologic events would be clearly shown. This simple and self-evident principle is the present geologic law of superposition. If the age of all rocks were determinable in such a manner there certainly could be no question about the veracity of evidence from paleontology. But as remarked above, there is no spot on earth to which one can go and see more than a few thousand vertical feet of stratified rocks. And *in no one of these places can the evolutionary story of any animal or plant be seen.*

The assumed fossil ancestors of modern forms must be pulled together from many different areas. To illustrate this, "perhaps the best known and most complete fossil pedigree among vertebrates is that of the horse." [15] Only the other day I was studying the fine collection of fossil horses on exhibition in Morrell Hall on the campus of the University of Nebraska. The following is a list of the members of this particular pedigree from "youngest" to "oldest," with the region in which the fossil was found: *Eohippus* from Wyoming; *Mesohippus* from Sioux County, Nebraska; *Miohippus* from Oregon; *Merychippus* from Daws County, Nebraska; *Hypohippus* from Sioux County, Nebraska; *Pliohippus* from Daws County,

[14]Herbert Spencer, *Illustrations of Universal Progress*, p. 343.
[15]M. F. Guyer, *Animal Biology*, p. 564.

Nebraska; *Plesippus* from Idaho; and *Equus excelsus* from Sheridan County, Nebraska.

If these fossil horses had been found in this order in successively younger strata, according to the law of superposition, then there would be some reason for considering that each larger and more specialized form had evolved from a smaller form before it. But since they had been pulled together from Oregon, Idaho, Wyoming, and from various counties in Nebraska, it is every bit as sensible to conclude that they were all living on the earth at the same time.

The only reason for arranging them in the above order from the Dawn Horse (*Eohippus*), the size of a fox terrier, to *E. excelsus,* the size of our modern horse, and exactly identical in bone structure, is the assumption that evolution has occurred. It is of interest in this connection to notice that although the fossil strata of the earth are assuredly known not to be more than between two and three miles thick in the deepest spot, still the evolutionary geologists have pulled together formations, as in the case of the horse, until "the total thickness of the stratified rocks now recognized would exceed 500,000 feet (= 95 miles) if the beds were directly superposed." [16] The biological scientist falls back aghast at the energy of his fellow scientist, who, when under the influence of the biologist's own unproved theory of organic evolution, is able to add ninety-two miles to the stratified layers of the earth and thereby increase the diameter of the earth 184 miles! The biologist regrets that after all this tremendous expenditure of energy, the geologist has nothing

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[16]C. Schuchert and C. O. Dunbar, *A Textbook of Geology, Part II—Historical Geology,* p. 66.

more to justify his herculean labor than the assumption of the truth of evolution.

VI

We read in Schuchert and Dunbar, "While the comparative study of living animals and plants may give very convincing circumstantial evidence, fossils provide the only historical, documentary evidence that life has evolved from simpler to more and more complex forms." [17] Here it is admitted that *paleontology furnishes the only real proof for evolution,* and as shown in the pedigree of the horse, this proof can be produced only *by assuming the truth of evolution,* and then pulling together successively more specialized forms from various parts of the world in order to prove the theory. This circular reasoning of the evolutionary geologist is too much for the special creationist. He lets go of the idea and falls back upon the sensible Biblical explanation which states that all these animals lived upon the earth at the same time. In historical geology, probably more than in any other field of science, an extremely worshipful attitude toward authority is necessary if the student is to see any sense in the conclusions of leaders in the field. We are forced to acknowledge that the *"Maestro dixit"* of the medieval schoolman still echoes in our modern scientific age!

The biologist cannot but feel that considerable of the blame for this inexplainable, circular type of reasoning—i. e., that the simpler animals lived before the more complex, therefore, older rocks will always contain simpler animals than more recent rocks (it follows that older rocks by definition will always contain simpler animals

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[17] *Ibid.*, p. 23.

than recent rocks) ; therefore, the simpler lived before the complex, and evolution is demonstrated!—lies at his own door because his fellows first sold this idea to the historical geologist and the latter proceeded to accept it as one hundred per cent true and has now built his entire science upon it. This fact is revealed in the preceding quotations from Grabau, Williams, Scott, Miller, and Schuchert and Dunbar. These authorities in historical geology aver that the rocks contain abundant proof of evolution. They are apparently absolutely sincere in this conclusion. But the faith in an unproved theory which is manifested in these workers as they pull together scattered fossils from all parts of the world and build them into arbitrary pedigrees of elephants and camels, just as in the case of the horses, is most astonishing to the uninitiated. Even if the horse pedigree and that of the camel and that of the elephant could be demonstrated in the rocks by the law of superposition, we would still lack the connecting links between kinds. That the geologist thinks he finds such links is manifested in the following statement:

> "There are no such things in the living world as 'connecting links' between the larger groups, but only such as occur between genera and between species. This means that most of the evidence for evolution in its broader lines, that is, from family to family, or from phylum to phylum, has been or can be, furnished only by the paleontologist, who is in an especially favorable position to observe it, seeing as he does the procession of life during the geologic ages. Unfortunately, however, the geological record is very imperfect." [18]

To the last statement of recognition of imperfection in the geologic record might well be added the statement that, real as fossils are, their use in proving evolution lies entirely within the realm of the subjective.

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[18] *Ibid.*, p. 38.

VII

In commenting on this imperfection in the paleontological record in the matter of missing links, the evolutionist A. H. Clark says:

"When we examine a series of fossils of any age we may pick out one and say with confidence, 'This is a crustacean'—or starfish, or a brachiopod, or an annelid, or any other type of creature as the case may be. . . .

"Since all the fossils are determinable as members of their respective groups by the application of definitions of those groups drawn up from and based entirely on living types, and since none of these definitions of the phyla or major groups of animals need be in any way altered or expanded to include the fossils, it naturally follows that throughout the fossil record these major groups have remained essentially unchanged. This means that the interrelationships between them likewise have remained unchanged. . . .

"Since all our evidence shows that the phyla or major groups of animals have maintained precisely the same relation with each other back to the time when the first evidences of life appear, it is much more logical to assume a continuation of the parallel interrelationships further back into the indefinite past, to the time of the first beginnings of life, than to assume somewhere in early pre-Cambrian times a change in these interrelationships and a convergence toward a hypothetical common ancestral type from which all were derived. This last assumption has not the slightest evidence to support it. All of the evidence indicates the truth of the first assumption.

"To this plain statement of fact the objection might be raised, 'This is all very true so far as it goes, but we must admit that the earliest evidences of life are the traces of simple and primitive forms; and, anyway, there was an enormous lapse of time between the first appearance of life and the period wherein are found the earliest fossil remains. So it is easier to believe that life gradually developed from simpler to more complex forms than that the major groups arose simultaneously.'

"The answer to this is that science is based upon ascertained facts. We take the facts as we find them and co-ordinate them into broad generalizations. The facts are that all of the fossils, even

the very earliest of them, fall into existing major groups. This is indisputable." [19]

VIII

Because of the actual shallowness of the entire body of fossil-bearing rocks and because of the scattered condition of the fossils in these rocks, i. e., the lack of actual superposition as a means of demonstrating possible evolution, it must follow that the forging of fossil links between modern kinds of organisms in an endeavor to prove evolution, is just as completely subjective, and therefore as unsatisfactory a business, as is the endeavor to prove that man and ape are blood related because their anatomy and much of their physiology are so similar. As pointed out by Clark, and as disproved by no geologist, the record from paleontology is that distinct kinds of animals have existed from the very earliest times and there is no evidence of converging to a common ancestor.

The record also shows that considerable variation has occurred within the limits of each kind. That is the same identical story that a study of modern processes of variation gives us. In Chapters seven and eight we noticed that modern changes are always confined to mere production of variants *within the kind.* The special creationist assumes that at least the major part of the paleontological record is but a cross section of animal and plant life at the time the world was destroyed by the Noachian flood. Variation within the kind had gone on in a marked way before the flood and it has gone on and is continuing in an equally remarkable way since the flood.

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[19] A. H. Clark, *The New Evolution*, pp. 100-105.

IX

Before bringing this chapter to a close I wish to give brief consideration to certain criteria which must be constantly borne in mind while studying fossiliferous deposits. I shall condense the eight principles discussed by George McCready Price,[20] and shall follow his wording quite closely. For an ample discussion of these principles one must read the original material in Price's book.

1. The larger divisions of the rocks (i. e., the groups) are named from the dominant types of life which they contain. But the systems, or the subdivisions of the groups, are likewise based just as wholly on the types of life which they contain.

2. The mineral or lithological characters are of little or no assistance in identifying, classifying, or naming the fossiliferous rocks. Where some peculiar type of rock is spread out over a large region, it may be often identified in disconnected localities by its structural characters, entirely without the aid of fossils. However, lithological characters are useful in identifying rocks only in a subordinate sense. "The same bed often changes its character from a sandstone to a shale, or from a shale to a limestone or a conglomerate, or again to a sandstone" (Dana), within a few miles, or even within a few hundred feet.

3. The condition of a rock as to its degree of solidification or crystallization is no guaranty as to the kinds of fossils which it may contain. Any type of life, even what used to be called the very "youngest," is likely to be found in crystalline or metamorphic rock, as old in appearance as any on the globe.

4. "A stratum of one era may rest upon any stratum

[20]George McCready Price, *The New Geology*, pp. 284-289.

in the whole of the series below it" (Dana). Not only so but it may even rest *conformably* upon it, giving every physical evidence that the one followed the other in quick succession.

5. The exact reverse of these conditions may also occur. That is, Cambrian or Silurian or Devonian beds may be found not only above Triassic, Cretaceous, or Tertiary, but they may be found in this position with just as much apparent conformability, giving every physical evidence, over vast areas, of having been deposited in the order in which they are found. Many cases of this kind are found in all parts of the world. A very well-known one in this country is the so-called "Lewis thrust fault" area including the whole of Glacier National Park and as far north as Chief Mountain in Alberta, Canada. Throughout this vast area, which involves many hundreds of square miles, Paleozoic limestones and quartzites rest in apparent conformity upon Cretaceous shales. Speaking in terms of fossils, the rocks containing trilobites (considered very ancient because of their simple structure) are frequently found resting in a perfectly natural way upon rocks containing dinosaurs (considered to be recent in evolutionary development).

6. Because of this reverse order of fossils, evolutionary geologists attempt to save their theory of simple before complex by assuming that a folding of the surface has occurred. Where we cannot prove by physical evidence that the strata have been disturbed, the *obvious order of superposition,* as shown by a vertical section or by outcrops of inclined strata, *ought to be recognized as the true historical order for the locality.* As physical or stratigraphical evidence is the only kind of evidence competent to satisfy in reference to the relative ages of two

contiguous strata, even this evidence is of only local value, pertinent *only* so far as the beds themselves extend.

7. When we decide that one bed is older than another, on stratigraphical evidence, it is obvious that we cannot say *how much older it is.* Even an angular unconformity between the two may mean only a sudden earthquake and the erosion of the tilted (unconsolidated) strata by submarine currents; and all this may have taken place deep beneath the waters, within a short space of time.

8. More common sense, and less theory, needs to be used in stating the total thickness of the strata found in any particular locality. The report of a total thickness of the strata in any particular locality which greatly exceeds what can be physically demonstrated in some vertical section, ought always to be regarded with suspicion. Such an excessive thickness is usually built up out of theory; and the geologists need to be especially mindful of the rule of inductive evidence that the inference from one theory must never be treated as the substantive foundation for another theory; or as it is commonly stated, we must never base an inference on an inference.

X

Thus in weighing the significance of the evidence from paleontology the student is chagrined to discover to what an extent the material has been artificially arranged by workers who appear to be ready to turn the world upside down to prove a theory. Scientists are generally thought to be honest workers. It is therefore with great regret that they see any of their fellows so completely stultified by their theory as to reason in a circle, and to arbitrarily set up synthetic pedigrees and attempt to palm them off

on the public as genuine. When miners in Colorado found a hoof of a modern horse deeper in conformable strata than the bones of Eohippus, the "freak of nature" of the schoolman appeared in modern transcendental form as a case of strata in the "wrong" order, and nothing more came of the discovery. The only real reason *Eohippus* is set ahead of *Excelsus* is not that their position in the rocks shows the former to be older, but merely that the theory of evolution demands such a sequence. This is true for all other fossil pedigrees which are foisted upon the gullible public in our educational museums.

Once again the disinterested observer must recognize that, as was true in classification, morphology, embryology, and physiology, the real evidence from paleontology, because of absence of connecting links between fossil groups and because of the impossibility of proving that a layer of rock at the surface of the earth here is any older or younger than a different layer at the surface somewhere else, is explained more sensibly from the point of view of the special creationist. The natural arrangement of fossils in the sedimentary rocks is just what would be expected were a world which was equipped with all these animals at the same time, overwhelmed with tidal waves which continually advanced upon and retreated from the dry land. Under such conditions, the more simple sessile and feebly swimming forms would be found to predominate in the deeper layers and the stronger swimmers and the more active forms (i. e., the more complex) would be found to predominate in the upper layers; but any one might be found in any layer.

In concluding this discussion of the significance of the evidence from paleontology, I quote the following from W. J. Tinkle:

"Already we have seen how the age of rock strata is estimated by the included fossils much more often than by its position. Unfortunately for us this makes the geologic record of very little value for the present study, for if the fossils are used to tell the age of the rocks, we cannot turn around and use the rocks to tell the age of the fossils. The evolutionary geologist assumes the truth of the theory of evolution and bases his study upon it. Consequently his findings cannot be used to prove that animals have developed from simpler forms." [21]

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[21] W. J. Tinkle, *Fundamentals of Zoology,* p. 438.

Significance of the Evidence From Geographical Distribution

I

IN CHAPTER ELEVEN some consideration has already been given to the facts relating to geographical distribution. However, in a book which is primarily an exposition of the theory of special creation, it appears necessary to devote a little more time to this subject.

This necessity arises from a widespread misunderstanding among evolutionists in regard to what creationists believe concerning the distribution of organisms. Reference has already been made to the fact that this misunderstanding can be traced back to the peculiar personal interpretations of scientists who claimed to be special creationists. In our day the inaccurate portrayal of the position of creationists on this point which evolutionists give, is doubtless due to the opinion of Louis Agassiz. We have referred above to his strange belief that modern animals had been created and placed in the very ecological niches in which we find them today. Apparently considering that the whole of the theory of special creation was sealed up in Agassiz, evolutionists commonly teach that creationists are all of Agassiz' opinion. As remarked several times before, however, those who would know the basic tenets of the doctrine of special creation must go to the Bible and read them for themselves rather

than depend on some one scientist's exposition of them.

A recourse to this record reveals that only in the original state at the time of creation were forms specially created and placed in their niches. This record tells of the great Noachian flood, which destroyed all land animals except those preserved in the ark. This record reveals that since the flood all land animals have found their way out over the earth from the mountains of Ararat to their present habitats. This record thus states that land animals since the flood have a single center of origin, and on the other hand plants have had innumerable centers of distribution, these centers being those countless spots where plants were able to survive the great flood. We find that once again the differences between these two theories are due more to lack of understanding than to real differences. In actuality, evolutionists and creationists see quite eye to eye in the matter of distribution of modern organisms.

II

In the Bible record of the flood we read that after the deluge animals were brought from the ark in order that they might scatter out over the surface of the earth. From this account the special creationist does not infer that the kangaroos hung knapsacks over their shoulders and immediately hiked down to Australia, nor that the anacondas tied their valuables around their necks and made the trip to the Amazon in one long and wriggling swim. The journeys to their present habitats were made in an intermittent fashion, each generation sending representatives a little farther from the original home. The presence of tapirs today only in South America and in the

Malayan islands, opposite sides of the earth, is indicative of the fact that animals migrated in more than one direction. The creationist holds that there is no reason for believing that this distribution of animals was accomplished by any other processes than those employed in distribution today.

Some forms seem to have been born with itchy feet or wings which have made globe trotters of them. However, most animals appear to disperse, not because of any particular inward urge, but rather because of a push from behind from others of their kind, in the form of reproductive pressure. Increase in number of individuals of any one kind causes a necessity for spreading outward toward the horizon in search for food and homes. This distribution over the earth is by no means a completed story. Animals are still continually exploring new horizons. Their arrival in new areas may be a result of deliberate individual endeavor or it may be that they arrive as wave-tossed survivors of some coastal accident.

III

One glance at a world map will show that, with the exception of the narrow break at the Bering Strait, a dry-land path leads from Armenia to all lands of the globe except Australia. In the case of the latter the East Indies even today form a fairly continuous bridge of stepping-stones to that southern continent. As regards the Bering Strait, there is no doubt that a land connection once existed between Asia and North America. With the strait closed, the cold waters of the Arctic would have been prevented from coming south, and the Japan Current would have curved around the coast line farther north than today.

The washing of those shores by the warm waters of this current would have produced a dry-land route that even tropical forms could have used.

With regard to possible land connections Hesse makes the following statement:

"With the exception of small coral islands, such as those of Micronesia and Bermuda, and volcanic islands such as St. Paul and those of the Hawaiian and Polynesian archipelagoes, there are perhaps few land areas which have been continuously isolated from others. This is undisputed for islands near the coasts like those of the Mediterranean, Ceylon, Formosa, Tasmania, and New Guinea and even Japan. The West Indies, also, were probably united with each other and with the mainland, and Madagascar was probably attached to Africa, though Matthew in 1915 defended the opposite view, that Madagascar and the West Indies are strictly oceanic islands. The Indo-Australian Archipelago and the Melanesian islands extending from New Guinea to New Zealand were probably mutually connected and reached Australia and Southeast Asia, though these connections were by no means contemporaneous or of equal duration. Africa was connected with Europe at times *via* the Strait of Gibraltar and probably *via* Sicily and Italy as well." [1]

The land routes were doubtless of much greater importance in the distribution of terrestrial animals than was the water path. Relatively few land animals can swim any considerable distance. The crocodiles are among the best swimmers. Two individuals are known to have withstood a 558-mile sea journey. Some snakes have survived the same journey. The European grass snake, *Natrix natrix*, is a good swimmer and has been found over three miles from land. The hippopotamus and polar bear seem to be the best swimmers among terrestrial mammals. The former swims the strait between the mainland and Zanzibar, a distance of nearly nineteen miles. A polar bear

[1] R. Hesse, W. C. Allee, and K. P. Schmidt, *Ecological Animal Geography*, pp. 110, 111.

has been found swimming in the open ocean over 18 miles from land. Reindeer also swim well and enter the water readily. The present record for red deer stands at about twelve and one-half miles. Generally speaking, however, comparatively narrow strips of water are effective in keeping most animals away from new territories. The eighteen miles of the Palk Strait has kept the tiger out of Ceylon. Marine paths are closed to frogs, salamanders, and toads, because these organisms are killed by salt water.

IV

Barriers to distribution are of special importance for terrestrial animals. Oceans probably stand first in this connection. Mountains and deserts may be placed with them as of importance; in some respects they are even more effective, because climatic changes are intimately associated with them. Although active motion in the form of swimming, flying, or walking are the usual means of dispersal for animals, still, passive distribution accomplished by storms and flowing water are of considerable help at times. Other animals, and especially man, have occasionally had much to do with the rapid distribution of some forms. Although at first thought it would seem that floating branches and trees and even large rafts might be of great importance in carrying animals across water barriers, still the actual transport could take place only under especially fortunate circumstances. Such rafts are of definite assistance in carrying animals to new territories farther down streams. The Paraguay brings large snakes, crocodiles, and jaguars to the neighborhood of Buenos Aires.

"Barriers to dispersal have a twofold effect. In the first place, they may separate closely related forms on the two sides of the barrier and thus prevent interbreeding. This makes possible independent differentiation of the two groups, since newly acquired characteristics will be restricted to that one in which they appear and not become the general property of both. . . . In two isolated related groups, . . . the individuals within each group will, in general, resemble each other more than they will members of the other groups. Thus arise races, varieties, subspecies, etc. In the second place, the presence of barriers operates to protect the 'species' within their isolated range from the competition of rival forms or enemies which might be dangerous to their survival, and thus enables the protected forms to take full advantage of all opportunities presented by their environment." [2]

V

The evidence of "species" change associated with geographical isolation is both direct and indirect. Animal breeders have found that, even without intentional selection, isolated groups of domestic animals develop in different directions in a relatively short time, and that the prevention of free crossing is an important element in selective breeding. The development of dairy breeds of cattle on the islands of Jersey, Guernsey, and Alderney illustrate both these principles. The chief evidences of the importance of isolation in the origin of modern "species" are derived from the study of geographic distribution of animals.

The German naturalist Wagner (1813-1887) appears to have been the first to emphasize the importance of geographic isolation in the transformation of "species." He believed that this was the only way that one "species" could become differentiated from another. But today we recognize other means of preventing interbreeding.

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[2] *Ibid.*, p. 73.

Most important of these are physiological and ecological isolation, which have been referred to earlier. The former is brought about by a change in the bodily and instinctive characters connected with reproduction, whereby the appearance of distinct groups within a "species" is possible without any geographic isolation. Mutational change is free in such cases to result in the development of considerable differences in appearance and behavior, even to the building up of new subspecies and "species." The progress toward distinct differences may not be erased by the interbreeding of the races.

Ecological isolation is likewise a potent factor in the establishment of variants from a common stock. This type of isolation doubtless originates in physiological changes brought in by mutation. These mutant forms may show a preference for a different habitat than that preferred by the parent stock. To use the same illustration here that has been used earlier, in the two closely related crayfishes that occur together in southwestern Pennsylvania, *Cambarus monogolensis* is confined to springs with clear water; the other, *C. diogenes,* lives in marshes and other stagnant waters. Though occupying the same geographical locality, still they do not interbreed, because their preferences for different kinds of water keeps them separated in their respective niches. Thus, with the elimination of opportunity for crossbreeding, any further mutational changes occurring in the two "species" may result in the development of "species" which are even more distinctly different.

When the differentiation into distinct "species" is due to geographical isolation, mutual fertility need not be lost. The geographical races of the lion or of the zebra are completely fertile, not to mention the various races of

man. Not only is this commonly true in geographical races of the same "species," but it is likewise true of such completely distinct forms as the various pheasants, the red deer of Europe, the American wapiti, or elk, and the American and European bisons.[3]

If we take a given "species" in a specified area as a starting point, we do not find its nearest relative in the same district, nor in a distant one, but in an adjacent area separated by some barrier. This principle, known as Jordan's Rule, seems to hold rather generally for expanding dominant groups of vertebrates. It is apparently not an unusual thing for closely related "species" which evidently have arisen from the same ancestor through geographical isolation to later migrate into the same area. Thus in the Chicago area there is evidence that some related forms have come together from the southwest, from the southeast, and from the north. Taylor calls our attention to this kind of situation in Central Europe among the grasshoppers.

VI

A notable and oft-cited illustration of the effect of geographic isolation on the development of new "species" is that revealed in studies of snails on the Society Islands. These islands are well isolated in the Southern Pacific, and their topography reveals a series of dry mountainous ridges between numerous relatively moist, deeply wooded, troughlike valleys. Since the snails do not inhabit the dry lowlands along the shores or the cold regions of the peaks, they are confined for the most part to the moist,

[3] *Ibid.*, p. 75.

wooded valleys. Here Crampton [4] believed he had found a beautiful illustration of "catching evolution in the very act." Fortunately an earlier naturalist, Garrett, had studied the snails of various of these same islands in 1861-1884. Crampton found that, in several cases, since the time of Garrett's visits the "species" had spread over wider areas and in several instances had produced new subspecies or varieties. For example, *Partula clara,* rare in Garrett's time and restricted to a series of valleys comprising only one fourth the area of Tahiti, had spread over four fifths of the whole island at the time of Crampton's visits and broken up into seven subspecies, mutations evidently having occurred in the old home area as well as in the more recently inhabited valleys. Crampton's earlier surveys were made in 1907 and 1909. He made a later study in 1919 and a resurvey in 1923. He found that his material, to use his own words, "afforded ample evidence that varietal differentiation had actually taken place in numerous ways and among several species, not only during the longer interval from Garrett's time to my earliest work, but also in the course of the short period that had passed since 1909." [5] The special creationist almost regrets that, in the face of the evolutionist's jubilance over his supposed discovery of real proof of evolution, he must remind the evolutionist that this does not prove evolution nor even suggest it, because the snails, granting all the variation which evolutionists claim here, are still just as genuinely snails as they were when Garrett made his first survey.

The work of Osgood on deer mice, *Peromyscus,* shows

[4] H. E. Crampton, "Contemporaneous Organic Differentiation in the Species of Partula Living in Moorea, Society Islands," *American Naturalist,* January-February, 1925, Vol. 59, No. 660, pp. 1-35.

[5] *Ibid.,* p. 8.

that every distinct climatic region and subregion studied was characterized by its own subspecies. Sumner's careful work [6] on the same genus shows that these subspecies are genetically distinct, although between at least six of them intergradations occur. These differences, when once established, were not erased even after eight years of experimental change of environment from arid to humid or vice versa. In the case of our common song sparrow, *Melospiza melodia,* at least twenty different subspecies are found in the various parts of its range from Alaska to Mexico and North Carolina. Some are larger and darker; some are smaller and grayer; but all lie within the range of individual variation or at least show intergradations with the individuals of surrounding territory. Should the variation be sufficiently distinct, or should the intergrades die out, the birds of that particular territory would probably be considered "species" rather than "subspecies."

VII

The facts of migration and isolation can be demonstrated nowhere more clearly, perhaps, than in the flora and fauna of oceanic islands as contrasted with continental islands and the mainland. At least many of the oceanic islands have arisen by volcanic action. On the other hand, continental islands have been cut off from the mainland by erosion and subsidence of an intervening land connection. Oceanic islands are inhabited by only such animals and plants as might have been carried there by winds, birds, ocean currents, swimming, etc. Flying forms of mammals are commonly the only mammals

[6] F. B. Sumner, "Genetic, Distributional, and Evolutionary Studies of the Subspecies of Deer Mice (*Peromyscus*)," in *Bibliographia Genetica,* Vol. 9, pp. 1-116.

present, unless man has brought some in. It is an interesting fact that even though there is a total absence of animals with hair, still plants not infrequently occur with seeds adapted to catch in hair. These have reached the island by the aid of wind, ocean currents, or floating debris.

The Hawaiian Islands are the most completely isolated archipelago, being about 1,860 miles from America and from Samoa. The outstanding character of the animal life is its endemism, i. e., its quality of being native to the islands. All the "species" and three fourths of the "genera" of land snails are endemic. Of 3,325 "species" of insects, more than 2,700 are confined to the islands; 170 out of 200 "species" of stinging Hymenoptera are endemic. The aquatic birds belong for the most part to widespread "species," and only five out of twenty-four "species" are endemic; contrariwise certain finchlike forms are wholly confined to the islands, and nine "genera" with about forty "species" form a special family. Each island on which a bit of the original forest is left has its special "species" of each kind of the nine "genera," and *Hemignathus* has two "species," one large and one small, on each of the islands of Hawaii, Oahu, and Kauai.[7] It perhaps should be made clear here that the use of "endemic" is not intended to give the impression that these animal forms either evolved here or were created and placed here specially. Its use merely indicates that in their present state of variation from their ancestral forms they are distinctly different from closely related "species" or "genera" in other parts of the world today.

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[7]R. Hesse, W. C. Allee, and K. P. Schmidt, *Ecological Animal Geography*, p. 88.

The Galápagos Islands present similar faunal characteristics. This archipelago is situated on the equator about 558 miles west of Ecuador. Two ocean currents flow past them, one from the coast of Peru and one from the gulf of Panama, but they are in a region of relatively little wind. Most of the forty-six "species" of land snails are endemic, but the "genera" are in every case those found also in Central and South America. Of the forty-six "genera" of birds, six are endemic. The sixty-six "species" of land birds, with the exception of the widely distributed bobolink and the cosmopolitan short-eared owl, are all endemic. The giant land tortoises, from which these islands take their name, are represented by fourteen "species" on the nine largest islands. These islands are some fifteen to twenty miles apart. Darwin observed that each separate island was tenanted by many different "species," yet that the kindred "species" resembled one another more than they resembled the related "species" on the nearest mainland of South America, almost six hundred miles away. In other words, migration from the continent has been much rarer and at longer intervals than from one island to another, so that the kindred forms on the islands had as yet diverged only sufficiently to be regarded as different "species" while those of the continent were as widely separated as "genera."

Here again we must keep our feet on the ground of solid facts and recognize that these changes are only occurring within the boundaries of the separate kinds. The tortoises, for example, merely develop other "species" of *tortoises,* and the lizards other "species" of *lizards.* There is no real evidence that changes from one *kind* to another have occurred.

VIII

In contrast with the fauna and flora of oceanic islands is that of continental islands. Trinidad, for example, is zoögeographically indistinguishable from adjacent South America; of sixty-five mammals and sixty-four reptiles very few are confined to it, and only thirteen out of sixty-three land snails are endemic. It is true that about one-third of the forty-one fresh-water fishes are endemic; even so they are mostly local races of widespread forms, with but two endemic "genera." The fauna of Tasmania is closely similar to that of Victoria south of the Dividing Range. That the ability to move about has much to do with the amount of endemism in "species" is well illustrated here where only 10 per cent of the "species" of birds are endemic, as compared with 81 per cent of the land snails.[8]

IX

The island of Krakatoa, whose organic life was entirely destroyed by a volcanic eruption in 1883, furnishes us with a specific illustration that scattering of animals, whether deliberate on the part of the animal or otherwise, is still going on actively today. Six years after the volcano exploded on this island and totally annihilated all life, a collector found a "species" of lizard present and a whole list of arthropods including spiders, flies, bugs, beetles, butterflies, and moths, which had crossed at least the twelve miles from the nearest land. A visit twenty-five years after the eruption yielded a collection of 263 "species," of which 240 were arthropods; four "species" of land snails were found; two "species" of reptiles, and

[8]*Ibid.*, p. 90.

sixteen birds composed the vertebrate element. Investigations in 1920-1921, thirty-eight years after the eruption, yielded 573 "species" of animals, among which were one snake, twenty-six breeding birds, two bats, and one rat. It is significant that not one endemic "species" was found on the island. The fauna was identical to that of the nearest islands.[9]

That the distribution of plants is going on just as actively as that of animals is revealed in the records of the restoration of the flora on Krakatoa. These reports also illustrate the manner in which plants bridge water gaps. The first vascular plants to appear in abundance were ferns, whose spores are readily scattered by the wind. Fifteen years after the eruption fifty-three "species" of seed-bearing plants had reached the island. Of these, it was estimated that 60 per cent, chiefly shore forms, were brought by ocean currents, 32 per cent by wind, and 8 per cent by animals.[10]

That the migration of plants over dry land can occur rather rapidly in favorable areas in the cases of mobile "species" is illustrated by the Russian thistle, *Salsola pestifer,* which was introduced into South Dakota in 1874 with flaxseed from Europe. By 1898 it had covered all the area east of the Rocky Mountains from the Gulf to Saskatchewan and today ranges over the whole country.[11]

X

That wide distribution from primary areas may, in some cases, not be stopped by oceans is illustrated "by

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[9] *Ibid.,* p. 56.

[10] A. W. Hill, Review of a paper by W. M. Docters van Leeuwen, entitled "Krakatau, 1883-1933," *Nature,* January 23, 1937, Vol. 139, pp. 135-138.

[11] G. W. Hunter, H. E. Walter, and G. W. Hunter III, *Biology, the Story of Living Things,* p. 41.

the floras of the two types of mangrove forests. The eastern mangrove has a rich flora very uniform along the coasts of East Africa, India, and Malaya. The western mangrove has a poor flora [i. e., few "species"], the important 'species' being the same on the western coast of Africa and the east coast of tropical America. The two types have no species in common. Distribution throughout the two regions appears to have been entirely by ocean currents. It has been shown that the mangroves and their associates of the western region are all capable of floating in the ocean for at least two months and that all could be carried by the main equatorial currents from West Africa to South America [a distance of 3,000 miles]. In mangroves the fruits are viviparous and it is the seedling which is carried." [12]

XI

Mountains or mountain ranges which rise from plains to a considerable height are for cold-tolerant animals, as effectively isolative as islands. Their faunas accordingly afford numerous evidences of the formation of "species" and subspecies due to isolation. The different "species" of ibex which inhabit the mountain ranges from the Pyrenees to the Himalayas and from Syria to Abyssinia, illustrate this. *Capra pyrenaica* is found in the Pyrenees; *C. ibex,* in the Alps; *C. severtzowi* and *C. raddei,* in the Caucasus; *C. sibirica* and its varieties, in Persia, Tibet, and the Himalayas; *C. nubiana,* in Sinai; and *C. walie,* in Abyssinia. All these "species" are still completely fertile with one another, and, according to the theory of special

[12] J. E. Weaver and F. E. Clements, *Plant Ecology,* pp. 125, 126; see also H. B. Guppy, *Plants, Seeds, and Currents in the West Indies and Azores.*

creation, are the descendants of a common ancestor which came from the ark as it rested in the mountains of Ararat.

XII

Although the evolutionist and the creationist see quite eye to eye in the larger aspects of the distribution of organisms, still there is one outstanding difference in their points of view. The evolutionist cannot separate in his mind geologic distribution and geographic distribution. The development of organisms is to him one continuous story from simple to complex, and the fossils are, as it were, photographs taken at successive stages in this development. Because he holds that there is no discontinuity between the past and present, he endeavors to trace the migrations of the ancestors of modern forms through the occurrence of their fossils here and there over the earth.

The special creationist, on the other hand, holds that there is a decided discontinuity between the world of organisms represented by fossils, and the modern world. He holds that present forms are blood descendants of many of the fossil forms. However, the presence of the American bison both within the rocks of the great plains area and feeding in the flesh upon the plains above them, does not indicate to him that the bison has lived in this area continuously since his fossil ancestors did. According to his theory, before the Noachian flood the entire earth was populated with an abundant fauna, each animal being pigeonholed in his respective ecological niche. Most fossils are remnants of that antediluvian world. After the flood land animals had to distribute themselves over the world from Armenia. The creationist believes that

the story of this distribution can seldom be read in the fossils. In other words, he does not believe that many fossils have been formed since the flood. Thus, in his mind geologic and geographic distribution of animals are two definitely unrelated subjects.

XIII

The point of view of the creationist which is set forth in this chapter may be somewhat surprising to evolutionists. This will certainly be true if they believed that he is of the opinion that each animal and plant was created as we find it today and set by its Creator in its modern ecological niche. It is ofttimes very revealing, if not amusing, to the creationist to discover what impossible scientific opinions the evolutionist credits to his account.

This static theory of distribution was the explanation of special creationists in Darwin's younger days. Darwin accepted it by an act of faith as did other creationists. However, when he made his five-year voyage around the world on the British cruiser *Beagle* (1831-1836), he observed the very facts we have been briefly considering in this chapter. As revealed in his diary, the facts which he observed began to conflict with his narrow conception of creation. In particular, the existence of many "species" with a small area of distribution, of forms closely allied to one another, but not alike, and taking the place of one another in different localities, yet not existing together, were difficult for him to reconcile with "nature's great plan." Why had it been necessary to create all these slightly differentiated and narrowly distributed "species"? He spent one month on the desolate Galápagos Islands

and felt himself "placed in proximity to the very act of creation itself." There he found a fauna markedly South American, though possessing peculiar "species." It began to appear very irrational to him that one "species" should have been created for each small island. But how, then, *had* the different "species" arisen, and why did they belong to South American "genera"? This problem, once in his mind, gave him no rest. His conclusions are known to everyone in his theory of evolution.

The creationist wonders why Darwin did not read the Bible record. If he had he could never have thought that it stated that everything was created and set statically in its present environment. Just as manifestly evident in the Bible as the record of creation is the account of the bringing of the animals from the ark, "that they may breed abundantly in the earth, and be fruitful, and multiply upon the earth." [13] The scattering of animals from South America to the Galápagos Islands, with corresponding change under isolation, was but the fulfillment of the expressed wish of the Creator. There was not even one small item in all this natural record which could not be found included in the general statements of Genesis.

Darwin's mistake was the same one that has been made by the majority of scientists ever since medieval times. He assigned some impossibly narrow interpretation to the Bible account of creation, observed that the facts of nature were opposed to his narrow view, then rejected the Biblical record because of his own inaccurate understanding of it. Scientists have understood that the Bible record gives no opportunity for variation. They see abundant variation everywhere today with the devel-

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[13] Genesis 8:17.

opment of modern "species" and "genera." The one great fact which Darwin missed with all his careful observation is the same one which modern scientists generally overlook in spite of all their pains, and that is that *variation does not go on without limit.*

Each separate kind may be constantly changing details of its appearance, but it never steps out of that peculiar locus (the kind) which was assigned to it in the beginning. Cats forever remain cats, although varying from tabbies to lions; and dogs remain dogs, although changing from great Danes to poodles. The *Drosophila* with all his one thousand-plus mutations has never achieved anything other than a vinegar fly. This variation locus in the case of each separate kind of animal and plant is one of the most evident facts in the natural world. The scientist too frequently merely recognizes the fact of variation; then using this as a springboard, he sails over the actual limits of the process to the unjustifiable conclusion of evolution of one separate kind into another.

★ ★ ★ CHAPTER SIXTEEN ★ ★ ★

Biological Adaptation

I

A NATURAL FACT which *even creationists* recognize in nature is that of adaptation. By adaptation I refer to the mutual fitness of organism and environment. Its consideration is of itself one of the most fascinatingly interesting phases of biology. Although we often pass the fact by unnoticed, still, when we stop to recognize it, we find that each organism is marvelously fitted for its particular niche in the great world of living things. The common minnow, for example, is strikingly modeled for gliding through the water. Its streamlined contour offers the least possible resistance, and its entire surface is self-lubricated with a slimy substance which reduces the friction still further. Its color and coloration are such that the minnow is inconspicuous against the dark stream bottom to any enemy looking down upon it, and light against the light sky to any enemy on the bottom of the stream. Its breathing mechanism is the last word in efficiency in the water environment, and likewise its way of taking food is admirably fitted to the sort of food it finds in the stream. The same wonderful fitness for its environment is manifested in all the minnow's various body systems.

One of the delightful dry-land examples of adaptation is the fitness of the common tree squirrel for its arboreal

environment, to which attention has already been directed in Chapter One. Some of the most remarkable cases of adaptation are to be found in the world of parasites. Whether one studies the complicated steps in the life cycle of the bass tapeworm or of the human liver fluke, the same remarkable fitness for its station in life impresses itself upon the observer. So it is with any organism—be it a desert plant with its numerous devices for prevention of excessive evaporation of water, or a grebe chasing a fish in the latter's own environment—microscopic or ponderous creature, each alike exhibits remarkable adjustment to surrounding conditions.

II

In addition to this ready-made or passive adjustment so manifest when one analyzes an organism in the terms of its environment, is the remarkable capacity often shown for individual adjustment to special conditions. Not only does the organism appear adapted to the average conditions of its environment, but it may likewise be able to adjust itself to relatively wide variations from the optimum condition. For example, if the leg of a crab, the ray of a starfish, the tentacle of a snail, or the tail of a lizard is lost, the part is gradually re-established through new growth. These organisms seem to possess a blueprint of their parts, as it were, and are able to re-establish a certain balance among these parts and thus bring themselves back to a state of completeness.

Another type of adjustment is the compensatory reactions which occur in an organ when a change in the systemic demand upon it is experienced. Thus we find an increase in the size of the heart takes place in case one of

its valves develops a leak and makes greater heart activity necessary in order to move sufficient blood out into the pulmonary artery or into the aorta. To a certain degree, the same hypertrophy occurs when an individual takes up a more active life. The increased demands on the heart muscle result in a more ample circulation through the muscle as well as an increase in the sarcoplasm of each cell, thus causing an enlargement of the organ. Other self-regulatory adaptational phenomena may be illustrated by the alteration of output of the digestive glands, depending on the quantity and quality of the diet, and by the production of antibodies in the blood stream in the presence of invading bacteria.

III

This subject of adaptation is commonly studied in order merely to recognize the fact of fitness of organisms for their surroundings, without any effort being made to solve the problem of how this suitableness for the environment has come about. In fact, some workers have maintained that no problem exists here, the supposed adaptations being merely products of our human imaginations, and that it is enough to describe how organisms are built and how they function, without assuming that there is any aim or purpose in the way the facts are associated. However, that there is a real problem here, there can be no doubt, and a difficult problem is never solved by dodging it.

Even he who runs may recognize that the biologist who assumes that all organisms made their first appearance on this earth as a single-celled glob of protoplasm, faces a major task in attempting to figure out how descendants of that one-celled ancestor could have evolved through natural processes into such a marvelously adapted

organism as the minnow or the squirrel, not to mention man himself. Truly it is a problem suited to only the most ambitious of biologists. Evolutionists who think they see a problem here and who accept the responsibility of solving it, may be divided into two main groups—those who lean toward orthogenesis in their explanation, and those who hold to either the Lamarckian or the Darwinian types of explanation.

The term "orthogenesis" has been used by many biologists in different senses ranging all the way from some mystical inner perfecting principle, as conceived by von Nägeli, to merely a general trend in evolutionary development caused by natural constitutional restrictions of the germinal materials, or by the physical limitations imposed by a narrow environment. In general, it may be said that many students of evolution are inclined to believe that in various related organisms certain variations are likely to occur more frequently and more widely than in others, in other words, that variation is *determinate;* and some believe that such changes, irrespective of whether they are helpful or harmful to the species, tend to accumulate in definite directions. In its more highly developed form orthogenesis conceives of evolution occurring in straight lines or in definite directions, regardless of whether the progressive series of variations involved are useful to the organism or not.

Some biologists attempt to explain the origin of adaptations by assuming that in nature the mutation process may somehow be directed by influences in the environment in such a way as to result in favorable changes for the organism. When the human skin is exposed to sunlight it develops a layer of pigment which becomes thicker with longer exposure. It cannot be known certainly whether

the sunlight is inducing mutations which result in more and more pigment or whether the pigmentation is merely an expression of a factor which has been carried for many generations. Most inherited factors are merely tendencies to this or that which require a favorable environment before they can have their visible effect. If the body response to sunlight is accomplished through mutational changes they would have to be purely somatic, because succeeding generations of individuals develop no heavier coats of tan than their distant ancestors. What we know about mutations gives no substantiation to the opinion that environmental influences direct mutations. Mutations appear just to happen. Their occurrence is apparently due to some change in the physiological state of the genes which is not influenced by the ordinary environmental factors. Dobzhansky points out:

> "To assume that an organism responds to the demands of its environment by producing only or even mainly those mutations that specifically answer these demands would mean that the organism has a prescience of the future. This is tantamount to the assumption of an intrinsic purposefulness of the living matter. On closer examination the theory of adaptive directedness of mutations falls under its own weight." [1]

IV

According to Dobzhansky, as expressed in his outline of the present state of the problem of biological adaptation: "Up to the present, only two types of scientifically articulate explanations of organic adaptation have been advanced." [2] These are known as the Lamarckian and

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[1] Theodosius Dobzhansky, "Biological Adaptation," *Scientific Monthly*, November, 1942, Vol. 55, No. 5, p. 401.

[2] *Ibid.*, p. 392.

the Darwinian. Lamarckism supposes that evolutionary changes are adaptive from the time they originate; that the changes arise in response to the exigencies of the organism's existence; that these changes appear first in the body or the mind, and only subsequently are fixed by heredity. Darwinism, on the other hand, assumes basically that changes originate in the hereditary materials, owing to forces either residing in these materials themselves or induced there by the environment. As they arise the changes have no intrinsic relation to adaptation; some of them may be harmful, others neutral, and still others useful to their carriers. Adaptations become established owing to the retention of only or mostly those changes which increase the probability of survival or of reproduction of their possessors.

Lamarckism has run into many difficulties, and it continues to exist at present only on the fringes of biology, although it seems to have caught the fancy of some philosophers and speculative thinkers. The question at issue is as follows: can changes appearing in the body in response to environmental stimuli induce corresponding changes in the hereditary materials? Experiments set up to test the possibility of such inheritance have generally given unequivocally negative results; the few alleged positive instances have not stood the test of critical scrutiny and repetition. This imposes such a strain on the theory that Lamarckists are forced to withdraw to a position which removes the whole question from the realm of the experimental method. They point out that experiments necessarily involve relatively short time intervals while nature has at its disposal incomparably greater time periods. The problem is thus formally unassailable.

As Dobzhansky points out, however, the hypothesis of

inheritance of acquired characters assumes the existence of a very intimate and direct connection between genes and body characters. Actually, biology has been turning away from the crudely preformistic notions according to which the genes borne in the sex cells are like diminutive vestiges of the organs of the adult body. The facts seem to indicate that the road from gene to character need not be a one-way street. Even if the genes in the sex cells may be influenced by the body carrying them, it seems very improbable that identical changes are induced in both.

Although the second of these two "scientifically articulate" explanations of adaptation is called Darwinian, the facts are that Darwin himself accepted Lamarckism as a sort of complement to his own theory. Neo-Darwinians eliminate all traces of Lamarckism and leave us a system of views which is really inductive Darwinism.

V

To continue with Dobzhansky's paper, the "Darwinian" view recognizes the three types of mutations which occur naturally. First, the neutral mutants which are always present in populations of living species. For example, practically all human races and strains are mixtures of several hereditary types differing in the composition of their blood. We speak of them as the blood groups O, A, B, and AB. As far as we know, no one of these groups has any greater survival value than the others.

Second, other mutants may respond to the environment in which the species normally lives in a manner less favorable than the original type does. However, these mutants

may have an advantage over the ancestral type in some environment in which the species occurs but rarely or not at all. This may result in a splitting of the original species into several races, each a master of its special domain. An example of this is found in certain plant species which are represented by races which do best in the valleys and others which thrive in the mountains. If both are transplanted the mountain race does poorly in the valley and the valley race dies in the mountains. A water flea is reported which survived with difficulty at the temperature at which the species normally lives, but which was able to exist at a higher temperature fatal to its ancestors.

Third, a mutant may respond unfavorably in all existing environments. It cannot become established, but will continue to arise from time to time by mutation as a phase, an aberration, or a monstrosity. An example of such a mutation would be some pathological condition in man such as hemophilia.

VI

Natural selection takes variants from the accumulated stock of changes, but does not itself produce new variants; natural selection does not induce mutations. The favorable gene combinations must arise before they can be judged by natural selection. Mutation produces the changes, and sexual reproduction serves as the mechanism for producing various gene combinations. The number of gene combinations is enormous. For example, it is virtually certain that every individual human being except identical twins possesses a gene combination not present in any other individual now living, or having

lived. Although natural selection creates nothing new and is a conservative factor, still it has at its disposal a colossal store of new combinations and variants upon which to work in the development of new forms. Certain observations on natural populations of flies belonging to the genus *Drosophila* suggest that adaptive plasticity of living "species" has been much underestimated. Changes adjusting a "species" to various phases of its environment, even though the phases may be of a very temporary nature, are taking place continuously, and their speed is appreciable enough to be observed directly. [3]

It is one thing to recognize this very manifest tendency in nature for organisms to vary, but it is an entirely different matter to prove that such variation has been the mechanism by which the present state of organisms has been built up. The special creationist sees these changes going on in nature just as clearly as does the evolutionist. Nevertheless, it must be said to the creationist's credit that he does not let the observation of these facts stimulate within him the assumption of an impossible accomplishment in such changes. Instead, he also recognizes a very obvious fact which the evolutionist in some mysterious way always overlooks. The creationist recognizes that these changes do no more for any organism than for the *Drosophila* referred to in the preceding paragraph, that is, for example, in the case of these vinegar flies they merely result in the adjustment of successive vinegar flies to new phases of environment. The changes are never of the quality which will convert one kind of organism into another kind. If we cannot find real evidence that one kind of animal or plant has changed into another kind,

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[3] *Ibid.*, p. 398.

how can even the most slavish devotion to a theory lead us to assume that the extremely complex and finely balanced systems of more complex organisms have evolved from the one-celled system of some primitive ancestor?

Dobzhansky, although an evolutionist, has so well expressed this difficulty which stands in the way of acceptance of the evolution theory that I will quote him here:

> "Much has been written about the improbability of 'chance' producing adaptive modifications. Can adaptive structures and functions arise by summation of the occasional useful variants? The difficulty appears to be especially formidable where complex and beautifully balanced organs, such as the human eye, are concerned. It is equally difficult to visualize the origin of the physiological correlations and interrelations between various organs and functions of the body which are accomplished, as we know or suspect, through an intricate system of chemical messengers and nervous stimuli. Could, for example, the series of physiological changes taking place in the woman's body in connection with pregnancy and childbirth have developed by natural selection combining numerous mutants? And what about the unbelievably complex structure of the human brain? The problem is aggravated further if one compares the systems found in different organisms, say a fish and a mammal. For it seems that each of these systems is balanced so delicately that it can function only as such—intermediate systems or systems combining the features of the two would be absurdly incoherent and unfit to survive.
>
> "The following analogy, or its variants, have been suggested to illustrate the above difficulty. Imagine monkeys shaking boxes containing printer's type; could the letters ever arrange themselves by chance to produce Dante's Divine Comedy? At first sight, this difficulty, which had already perplexed Darwin, appears well-nigh insuperable, so much so that it has made all forms of Darwinism unacceptable to many thinkers in and out of biology. There is no use pretending that this difficulty has been satisfactorily solved." [4]

Admiration is due the workers who do not dodge the necessity of explaining a problem just because it is hard. But along with the will to attempt the solution of hard

[4] *Ibid.*, p. 399.

problems must go the ability to recognize whether a problem is a sensible one or a purely senseless one. In preceding chapters attention has been repeatedly directed to the fact that phenomena in nature can in every case be explained more sensibly from the point of view of special creation. The insurmountable difficulties presented in the above quotation vanish when they are viewed from the angle of special creation. These facts in nature do not constitute difficulties for the creation theory; rather they constitute very strong reasons for believing that the fish was created a fish and the mammal a mammal.

VII

The evolutionist, as described by Dobzhansky, has reason for believing that a solution of these difficulties exists. Our attention is called to the fact that sexual reproduction is a marvelously efficient "shaker" of the biological letters. Furthermore, attention is called to the fact that the "monkey analogy" misconstrues the situation, in that it overlooks the historical aspect of the process of adaptation. In fact, as expressed by Dobzhansky, the theory of evolution does not demand that the whole of the *Divine Comedy* be produced at once. Rather "a chance concatenation of letters had produced only the first verse, and as soon as that appeared, the letters composing the verse were bound together. The second, third, and the following stanzas were formed and added to the first. Thus the *Divine Comedy* grew and developed. . . ." Even though this is an interesting figure, the biologist must recognize that complex organisms are not merely associations of separate "lines of type." In fact, in order for a new character to be added there must be a certain

dynamic readjustment of all the characters. The product is an entirely new system—not merely the old system with an appendage added. And the odds are much more in favor of the chance change's bringing in an incompatibility which will make printer's pi of all the preceding lines than that the change will be successful. It is not sensible, and therefore not scientific, to conceive of chance mutations building up our modern complex forms with all their delicate balance of parts.

VIII

Regarding this transition from one adaptive system to another, Dobzhansky says:

> "The evolutionary transition from one integrated adaptive system, such as fish, to another system, such as mammal, presents difficulties on any theory yet proposed, since, as pointed out above, intermediate systems would seem to be poorly balanced. Indeed some paleontologists believe that the beginnings of most major biological groups are conspicuously absent or rare in the geological record. Provided this belief is justified, we are forced to admit that evolutionary transition is sometimes a painful process, leading to a temporary eclipse of the group of organisms which is in the throes of reconstruction." [5]

In a previous chapter we have already called attention to the absence of fossil connecting links between the large groups of plants and of animals. This is a condition which all paleontologists admit. The writer of the above quotation not only is aware of this fact in geology but also recognizes that in the field of physiology these intermediate stages would lead to "temporary eclipse of the group." To a thoughtful person who stands back from these problems and views the whole matter in a disinter-

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[5] *Ibid.*, p. 400.

ested way, it would seem like a very poor process of proof for a theory in which proof consists first in the viewing of a certain stage setting. The curtain is then dropped, and while the stage is hidden a certain process is *said* to be occurring behind the curtain. Then the curtain rises, and, behold, new objects are before us; but how are we to *know* that they were produced in the way described? Again it is painfully obvious that the only thing which can save the theory of evolution is a vast amount of faith in it. The use of "faith" might rightfully be questioned here, for faith is a reasonable belief in something which is not supported by known facts. But what shall we call a belief which is persistently held even though it is *out of harmony* both with common sense and with so many facts which bear on the subject?

The author of this last quotation states that this fact "presents difficulties on any theory yet proposed." The creationist suggests that evolutionists here give consideration to the theory of special creation. It not only will explain sensibly the absence of connecting links between major groups of fossil organisms, but will also in like manner explain the appearance of fish and mammal without the necessity of any "painful" and risky processes in their production. The acceptance of the theory of special creation is here not a mere following of a line of least resistance, but rather a giving heed to the most sensible way out.

IX

As already stated, the creationist recognizes the fact of adaptation in nature. However, with him the demands upon the process are comparatively infinitesimal. Where the evolutionist must find reasons for believing that adap-

tation has resulted in the change of one-celled ancestors into our modern forms, the creationist recognizes only those adaptational changes which are observed actually to occur. He has no need to search wishfully for transformations which nature gives no promise of ever showing to him. To the creationist the hand-in-glove fitness of organisms to their respective aquatic or terrestrial niches is largely due to the direct act of a Supreme Intelligence. The fish was created fit for its water environment, and the terrestrial mammal was created suitable for its dry-land habitat. The environment was prepared first; then the organisms were fitted into it. That adaptation does occur within certain limits even in our day has already been pointed out in the first paragraphs of this chapter.

Nature is full of examples of this change which actually occurs as the organism, to a certain degree, becomes adapted to its environment. To illustrate, the weasel, the snowshoe rabbit, and the ptarmigan show a color change which better fits them to their summer or their winter habitat; the European starling, *Sturnus vulgaris,* which was first introduced into New York City in 1890, has in great numbers taken over the habit of migrating south with the blackbirds and thus spending a more comfortable winter than do those of his fellows who stay in the cold of the north; the suiting of pelage to degree of warmth or coldness is illustrated not only in skunks, foxes, and other wild mammals, but also markedly in our domesticated cattle and horses that are forced to winter in the open; the marvelous fitness of the polar bear to an environment of ice and snow is doubtless largely adaptational; the development of races of scale insects which show greater resistance to original types of fumigation with hydrocyanic gas in citrus orchards is certainly adap-

tational; likewise with the emergence of a race of coddling moth adapted to walnut instead of apple; the development of new types of rust that destroy strains of wheat which were resistant to ancestral strains of rust; the emergence of plant strains which do better in colder or warmer habitats than their ancestors; the fitness for survival of low-growing plants in the tall-grass prairie; [6] the development of more deeply rooted flax which will thrive in soils with deep-water tables, but do poorly in soils with high-water tables; and so on *ad infinitum*. It would appear that such adaptations could be spoken of as *secondary,* and those in which they were created, i. e., the fish for the water and the squirrel for the tree, might well be termed *primary*.

The special creationist makes it clear that he does not hold that these secondary changes appear in response to need, but rather that such changes are always occurring within their clearly evident limits, and specific environments may select the changed form as more fit to survive. The natural resistance of a field of manifestly identical cabbage plants is not apparent under ordinary circumstances, but when the plague of cabbage yellows descends upon that field, the survival of a half dozen plants in the entire area reveals that chemical change, very probably mutation, had occurred in these plants, which fitted them to survive the new environmental stress.

Such secondary adaptational changes are recognized by the creationist along with other natural phenomena. But he reminds evolutionary biologists that these biological adaptations are most definitely *not of the quality* which would transform one kind of organism into another

[6] Frank L. Marsh, "Water Content and Osmotic Pressure of Certain Prairie Plants in Relation to Environment," *University Studies,* June, 1940, Vol. 40, pp. 1-44.

even in a million million years. In the light of this position how can it be fairly said to the creationist that he has the monopoly on ignorance, dogmatism, and prejudice, when in every trial of theories his explanation of natural phenomena proves to be the more sensible one? It would appear to be pertinent even in our day for a scientist to adjure his brethren that more heed be given to *facts* and less to *theories*.

★ ★ ★ CHAPTER SEVENTEEN ★ ★ ★

A Creationist's Creed

I

THE BRIEFNESS of the Genesis record of origins makes possible considerable variation in the finer details of the creeds of individuals who accept the theory of special creation. At this point, near the end of this volume, I will record some of the larger points in my personal interpretation of the theory. I do this for two reasons. First, I believe that the expression of such creeds serves to stimulate thought in the direction of the formulation of concrete ideas in the minds of other individuals in the matter of a theory of origins. Second, such an expression of details relating to creationism may help other creationists by suggesting something which they will wish to add to their own creeds.

As I list the points in this creed, I do so with the knowledge that it is possible that no other creationist will agree with me in every point. Furthermore, it is very possible that other views of creationism which have the support of facts, are just as near the correct story of the origin of living things on this earth as is this one. However, the following points are those which I personally believe are in closest harmony with the Scriptural record and with the testimony of nature.

II

I hold that about six thousand years ago, on the third, fifth, and sixth days of a literal week, creation week, the Creator, by His divine power, made to appear upon this earth a richly diversified flora and fauna consisting in many instances of individuals just as complex in structure as any of our present-day forms. These original, created kinds I will call Genesis kinds.

I believe that modern representatives of some of these different kinds are men, apes, dogs, cats, horses, cattle, rabbits, oak trees, maple trees, violets, sunflowers, dandelions, water lilies, and bluegrass.

I hold that these distinct kinds, even when quite similar morphologically, were isolated from each other by chemical differences which made it impossible for a germ cell of one kind to unite with a germ cell of any other kind and produce offspring. In other words, I believe it was impossible for one kind to hybridize with any other kind because of this condition of physiological isolation.

I hold that from the day of their creation the Creator has caused plants and animals to live through a constant manifestation of His divine power in the form of the physicochemical "laws" which we study, often unclearly, in our laboratories today.

I hold that the surface of the earth in the beginning was greatly diversified, i. e., that it contained a great wealth of ecological niches. The temperature in these niches, to cite a specific physical factor, varied from temperate on mountaintops to tropical in some valleys. The general temperature which may be said to have pervaded the entire globe, I hold, was subtropical.

I hold that except for the man kind of organism, it is

possible and very likely that every kind was present in the form of several races or varieties. These would correspond to our present-day geographical or even ecological races. I hold that although the races or varieties of a single kind were separate in space because of their ecological preferences, still it was physiologically possible for at least many of them to hybridize with other races of their kind. If any climatic change would come which would disrupt the factors in the ecological niches and cause varieties of a kind to wander from their places, it would naturally follow that they would not infrequently hybridize with their "blood relatives," i. e., with other races of the *same* kind. I use the term "blood relative" here not to imply that these races had descended from a stem ancestor, but rather, that they were created with chemical constitutions sufficiently similar to make them physiologically compatible. I hold that it is possible that different races of the same kind had different chromosome numbers, e. g., the horse and the ass.

My theory allows one or the other of two original situations here. I see light in holding that these Genesis kinds could have been represented by but a few individuals in whose chromosomes existed the same possibilities of variation that we see today (each within the limits of his kind). Thus as the numbers of a kind increased through a fortuitous combination of different chromosome units, the individuals would seek out those habitats peculiarly suited to them. In this way the earth would eventually be populated. On the other hand, I see light in assuming that each race was created with his complement of peculiar chromosome units and placed in his respective niche. If the latter situation were the case, I would assume that the chromosome units in these organisms were subject to the

same natural processes of change which are in force today.

In either case, the change in physical factors which accompanied the entrance of sin caused these races within each kind to wander from their "appointed" places, to meet and frequently to hybridize. Eventually many original races became so confused as to nearly vanish from sight. Everywhere were seen the results of hybridization. In the fossils is preserved for us a cross-section of this world of confusion.

I hold that the Noachian flood covered the entire earth, and that God preserved alive in Noah's ark two of all "unclean" kinds and seven of all "clean" kinds of dry-land animals. How many of the original races of each kind were preserved my theory does not conjecture. It may be, for instance, that both the ass and the horse races of the horse kind were present in the ark.

I hold that since the flood the same confusion of original races and of races which have arisen since the flood has continued. As an illustration of change within a single race, the race of man has become at least three, and even a second "species" is thought by some to have appeared and existed as *Homo neanderthalensis*. Suffice it to say that variation has gone on within the race of man to almost unbelievable lengths.

I hold that it is quite impossible today to tell which forms are members of an original kind. I hold that the physiological distinction of kinds has held right down through, so that even in our day members of two different kinds are always sterile. If hybridization can occur even to the accomplishment of the early stages of segmentation, I hold that the two individuals must be members of the same original kind. However, failure to unite in fertilization does not necessarily indicate membership in two

different kinds because of mutational changes which may produce sterility even between races of modern "species." I hold that mutation could not work in an opposite direction and cause two different kinds to become fertile because the difference between two kinds is too vastly complex to be bridged by the mutation of even a dozen units though they should do so unnatural a thing as to occur all at once.

I hold that all the processes of change which have ever existed in organisms have never been quantitatively nor qualitatively capable of accomplishing the variation of an organism other than within a certain circumscribed area within the boundaries of the original kind. Each new variant is manifestly a bona fide member of his kind. Variation is the law of nature, but each organism can never produce a variant which is sufficiently different from itself to constitute a new kind. Many Linnaean "species" and a vast number of "species" names assigned since his time are but variants or races of original kinds.

I hold that in many cases changes in organisms since the deluge have been so great as to build several geographical races within a single kind, e. g., the twelve "species" of American caribou and the seven "species" of Old-World ibex. Of course, the final test for membership in these polytyptic kinds will be cross-fertility.

Evolution or Variation Within the Kind?

I

BEFORE BRINGING THIS VOLUME to a close I wish once more to direct attention to a point where the principal misunderstanding concerning the doctrines of the theory of special creation appears to lie. The time and energy consumed in writing this book will be fully repaid if I can get one misunderstood fact clearly before the scientific and general public. That fact is that the interpretations of the theory of special creation given by Linnaeus and Agassiz are *not correct explanations of creationism.* This is true because their interpretations were out of harmony with both the statements of the Bible and the facts of nature. If any theory is to pass as a theory of special creation it must harmonize with all pertinent Bible statements and with all *facts* in nature which bear upon it.

In preceding chapters I have already called attention to the assumption on the part of evolutionists that the opinions of Linnaeus were the last word in the interpretation of the theory of special creation. This fact is further illustrated by the following quotation from a current biology text:

> "In the formation of species the process [of origin of variations] has been carried farther than in the formation of varieties; varieties are species in the making. On this theory the confusion of varieties

and species is inevitable. If, on the other hand, a species of today is composed of the unmodified descendants of an originally created species, as maintained in the familiar dictum of Linnaeus, '*Species tot sunti, quot formae ab initio creatae sunt*' (There are as many species as forms were created in the beginning), species should be fixed and sharply drawn. The observed facts fit well with the theory of evolved species, but are somewhat embarrassing to the doctrine of special creation." [1]

If evolutionists really believe that creationists think "species" are fixed and unchanging, there is little wonder if they would be of the opinion that something is very definitely wrong somewhere with every creationist scientist. What the author of this quotation means here by the word "species" is not evident. If he means the modern "species" erected by taxonomic "splitters" he has an entirely inaccurate conception of what special creationists believe. If he is using the word "species" in the sense that Linnaeus used it, he may have the correct conception of the theory, and again he may not, because Linnaeus, as pointed out in Chapter Ten, was obviously wrong very frequently in assigning "species" names to natural groups which manifestly were smaller than the original Genesis kinds to which he thought he was assigning them. Whatever the author of the textbook containing this quotation had in mind, it is very clear that the student reading his text would gain the impression that the theory of special creation is greatly embarrassed when brought face to face with facts. The preceding chapters of the present volume have shown that, to the contrary, the theory of the creationist has in every major test the most sensible explanation of the facts.

The special creationist *does* believe in "fixity," but it is most decidedly not "fixity of 'species.' " Many species

[1] E. L. Rice, *An Introduction to Biology*, p. 506.

(modern) are being built up and have been built right under our eyes today. The creationist welcomes this knowledge with a mind just as joyously open to the fact as does the evolutionist. Anyone with his eyes open to facts regarding the origin and development of any one of our modern, economically valuable plants or animals must become very conscious of the fact that there is rarely "fixity" of modern form and coloration.

II

A strange thing about the general misconception of the teachings of the theory of special creation is that evolutionists appear not to know the origin of the theory. To clear up this point, I wish to state very briefly that, as far as historical records are concerned, the theory of special creation had its origin in the Bible. The evolutionist reader is likely to say, "I know that." I wish to say to him, Then why have you not gone to the original source of the theory instead of to Linnaeus and Agassiz in order to find out what it teaches? It is baldly evident today that all evolutionists who think that creationists believe in "fixity of species" have not read what the Bible has to say on these points. While evolutionists have not studied the Bible to learn the teachings of its theory of origins, special creationists have gone to *Origin of Species* and to similar historical landmarks of the origin of the theory of evolution, and studied their doctrines. This fact is part of my reason for saying in an earlier chapter that special-creationist scientists are better informed and more broad-minded in their views than are evolutionists.

The evolutionist or any other person who shows himself studious enough and of sufficient breadth of mind

to read Genesis, may be surprised to learn that it is there stated that in six days God created this earth and all that is in it. The record is that in the creation of the plants and animals each form that was created was made "after his kind." Nothing is said about "species." We read:

> "And the earth brought forth grass, and herb yielding seed after his kind, and the tree yielding fruit, whose seed was in itself, after his kind." "And God created great whales, and every living creature that moveth, which the waters brought forth abundantly, after their kind, and every winged fowl after his kind." "And God made the beast of the earth after his kind, and cattle after their kind, and everything that creepeth upon the earth after his kind." "So God created man in His own image, in the image of God created He him; male and female created He them." [2]

The obvious teaching of these statements is that plants and animals were created in forms just as complex as we see them today. There is no indication in the record that one form evolved into another form, because the whole creation was finished in six days, each of which was set off by an evening and a morning. When the simple record is read, there is but one reasonable interpretation, that each day of creation week was the same in length as all the other days of Genesis; obviously the same as those which succeeded until our time. Adam, according to the first two chapters of Genesis, did not evolve, but in the period of time between two sunsets was created, looked over the available dry-land animals, named them, felt the need of a mate suited to himself, was made to fall asleep while a rib was removed and formed into a wife for him; then after awakening, he and his wife still had time to get their bearings and together view the setting of the sun. There is no time in this simple story for evolution to have occurred.

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[2]Genesis 1:12, 21, 25, 27.

The reasonable conclusion, from the text, is that every kind of plant and animal was just as distinct and clear-cut an organism as was man. Man was one of the Genesis "kinds" which originated in a single pair, and as such, modern man with all his physical and mental differences very logically illustrates, to a certain extent, what has doubtless happened in every created kind of plant and animal. Upon what possible ground can we claim that the theory of special creation teaches that things do not vary? Different systematists, as cited by Darwin, have classified the various human races as belonging to 1, 2, 3, 4, 5, 6, 7, 8, 11, 15, 16, 22, 60, and 63 "species"! That is what has happened to one Genesis kind. What excuse can be set forth by evolutionists for saying that the doctrine of special creation is one of unmodified descent? Such an idea is most certainly foreign to the only authoritative statement of the theory extant.

III

As just stated, man is the only modern example of a group of animals which we can be certain constitutes one Genesis kind. The man kind is clearly marked off from other animals. No authentic record exists that man has ever crossed (produced offspring) with any other kind of animal. No taxonomist has the slightest difficulty in differentiating man, even though a bushman or a pygmy, from other kinds of primates. This modern observation in connection with the Genesis statement that each kind reproduced "after his kind" gives very evident reason for assuming that all Genesis kinds were just as distinct morphologically and physiologically, i. e., different in appearance, and reproductively sterile across kinds. If

there was a man kind at creation there were possibly also such other groups, as the horse kind, the dog kind, the cat kind, the ape kind, the rose kind, the bean kind, the oak kind, etc.

The record does not make clear whether these original kinds, or baramins, were originally of a single race, as was man, or whether in some cases several ecological races were created within the kind. If such a multiraced kind existed there is no doubt but that races were cross-fertile and reproduced in all cases according to their kind, i. e., ducks from duck eggs, oaks from acorns, and doglike animals from doglike animals. The only type of "fixity" suggested in Genesis is that of the baramin. Variation was evidently extreme in many cases, but extreme as it might be it never resulted in an erasure of those qualities of morphology and physiology which demarked the baramins. This situation today is one of the most evident facts in the biological world. The most degenerated man is still unquestionably a human being.

IV

As suggested in an earlier chapter, if reproductive compatibility is a characteristic of Genesis kinds—i. e., if races of baramins were fertile *inter se,* but sterile when mated with members of another baramin—an investigation of hybridity in nature today should enable us to sketch very incompletely the extent to which variation has gone within original kinds since creation. Innumerable fantastic stories to the contrary, a study of hybridization from reputable sources reveals that the parents of hybrids, be the hybrids merely embryos which die in early developmental stages or hardy individuals such as the

mule, are always manifestly members of the same baramin. In making such a study the investigator must use great care not to be too hasty in accepting accounts of hybridization. To use the same illustration cited above, Morton, in 1847, listed among authentic cases one which is very evidently unauthentic, as it is a very wide cross and has never been reported elsewhere, i. e., a cross between a bull and a sheep. Because of persistent rumors of a sheep × pig cross, the *Live Stock Journal* finally published an article [3] denying that there was any conclusive evidence that such a hybrid had ever been produced.

Illustrative of another type of error in discovering wide crosses, Loeb [4] stated that practically all teleosts of the ocean would cross. It is now known that in such cases the foreign sperm merely instigates development and is thrown out bodily early in the segmentation process. Authentic cases of at least the beginning of development of offspring are illustrated by such crosses among animals as horse × ass, horse × zebra, kiang × onager, lion × tiger, guinea × pheasant, chicken × turkey, swan × goose, rat × mouse, sheep × goat, ox × bison, ox × yak, ox × eland, zebu × yak, dog × wolf, rabbit × hare, and red deer × elk. In all these cases it will be seen that organisms are unquestionably still reproducing "each after his kind." Although many cases of matings of two different kinds of animals have been known to occur, still, fertilization of the egg did not occur.

V

It is not necessary, perhaps, to recapitulate that no authentic cases of man × ape or any other man × animal

[3] *The Livestock Journal,* January 16, 1931, p. 72.
[4] Jacques Loeb, *The Mechanistic Conception of Life,* p. 24.

cross is known. A great deal of search has been made in an effort to uncover at least one authentic case of such a cross, but such a hybrid is not known. (See Chapter Nine.) This fact stands although there has been a much wider mixing of human germ cells with those of other kinds than in the case of any other baramin. Many stories of man × beast crosses are always floating around, most generally in direct proportion to the ignorance and superstition of the people among whom the tales are circulated. Scientific knowledge eradicates these unfounded tales. Monstrosities do appear occasionally among human babies. This fact, coupled with the sordid fact that human-beast cohabitation frequently occurs where mechanically possible, has led many to conclude that the monstrosity was a man × beast hybrid. In a hospital with which I was once connected for several years, a baby was born which had no neck nor head. Its face sat upon its shoulders, and its feet and hands were webbed paddles. No one around the hospital ever suggested that the abnormality was the result of a man × frog cross. However, if it had had any doglike characteristics tongues would doubtless have started to wag. All babies, normal or monstrous, born to women have without exception had purely human parents.

Some evolutionists who have studied the Bible sufficiently to discover that the Mosaic law forbade man-beast cohabitation on penalty of death, have used this fact as "proof" that the Bible teaches the possibility of offspring in man × beast crosses. This statement is then used in an attempt to disprove Biblical inspiration, because such crosses do not actually occur. This conclusion again reveals that some shallow reading has been done on their part. A careful reading of Leviticus 18:23-25; 20:15, 16,

shows that the prohibition was not made to prevent man × beast hybrids but rather to maintain *moral purity*. That this reason is unquestionably the aim of the law becomes very evident when Leviticus 18:22 and 20:13 are read. In these references it will be noticed that the same prohibition and punishment was set for man-man—i. e., male with male—cohabitation, where offspring would be impossible. No hybridization of man and beast is recorded in the Bible. However, the Mosaic law did contain restrictions against hybridization of their domestic stock with inferior races or strains. That offspring would be expected in these cases is evident in the wording, "Thou shalt not let thy cattle gender with a diverse kind." [5] This statement not only does *not* indicate that, for example, cattle and goats could cross, but at the same time it also makes clear that the reason for this prohibition was to prevent the "gendering" of offspring, while in the prohibitions concerning man the purpose was to prevent "defilement" of man.

VI

Returning now to the thought of the first paragraph of this chapter, the only type of "fixity" that can possibly be read into the Bible account is that of the Genesis kind. The theory of special creation, therefore, is not a theory of descent without change. Change is permissible, but definite limits are established for it at the boundary line of the kind. The person who represents the theory of creationism as being one which assumes a coins-from-the-mint type of reproduction, is confused in his thinking. Rather, in the assignment of such a doctrine he is speaking

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[5] Leviticus 19:19.

of the early opinions of Linnaeus and of the mature opinions of Agassiz. It has always been a puzzle to me why the scholars of Agassiz' day did not "pick him up" on his interpretation of the theory of special creation when he maintained that animals had been created as we now find them and placed directly by the Creator in the niches they now occupy. His opinion was entirely wrong in the light of the doctrines of the Bible. In the account of the flood in Genesis 7 and 8 it is recorded that all terrestrial animals died with the exception of those in the ark. The ark grounded in the mountains of Ararat, and it was there that its refugees disembarked. From that one spot the Bible states that distribution of terrestrial forms has occurred. Nothing is said anywhere in the Bible of animals' being placed in their respective environments other than at the time of their creation. Even then they were "instructed" to replenish the earth. It is difficult to understand how Agassiz could have read the first two chapters of Genesis and missed the eighth.

Rather than being a theory which holds to a coins-from-the-mint type of reproduction, it is one which requires very definite variation from original stocks. It is a theory which must check up with Biblical statement and natural fact. The natural facts are that hundreds of thousands of "species" of animals now populate the earth. All the ancestors of the dry-land forms of this population were able to be housed in a three-story houseboat which was, in my opinion, possibly not more than 515 feet long, 86 feet wide, and 52 feet high. These ancestors were all present at least by *twos*. The "clean" kinds, i. e., mostly those which were vegetarian (and that would doubtless be the majority of them), were present by *sevens*. In addition, space was found in this limited structure for eight

human beings and their necessary belongings, along with an ample food supply for all on board, and for whatever stores of propagules of such economic plants as Noah wished to preserve through the deluge. In the face of these facts the theory of special creation holds that the ancestors of modern land animals were indeed not a multitudinous group. Each original dry-land kind was included in that group. It seems quite necessary to conclude that, for example, doglike animals were represented by one pair, or at least, by no more than a very few pairs of ancestors. All modern dogs, i. e., dogs, wolves, coyotes, foxes, jackals, hyenas, etc., must have descended from these few stem ancestors.

It must become very clear that the special creationist biologist is just as busy hunting for processes of variation which could accomplish the diversity that is seen today within each kind, as is the evolutionist biologist in his search for missing links and for processes which are of the quality of nature that can produce new kinds. Thus when the evolutionist understands the true situation, he will find the theory of special creation diametrically opposed to the idea of "fixity" and "descent without change." I never cease to marvel how evolutionists can so consistently overlook this necessary doctrine of creationism.

VII

As every biologist will immediately recognize, the explanation of modern forms by special creation and descent with determinate variation (physiologically determined), is amply provided for by natural processes of change which have been so ably described by Dobzhansky in his book *Genetics and the Origin of Species,* by Gold-

schmidt in his volume on *The Material Basis of Evolution*, and by Mayr in his *Systematics and the Origin of Species*. The creationist owes a great debt of gratitude for the careful presentation by these biologists of what is known of those natural forces in genetics which show so conclusively that there are limitations in natural processes as regards the matter of change, so that each kind of organism can vary from its respective stem ancestor into the possibly numerous modern forms, but cannot vary to the extent of changing into some new kind.

Reference has already been made to one of the most classical illustrations of distribution from the mountains of Ararat in Armenia with continual occurrence of variation, which is found in the various "species" of ibex (*Capra*). According to the theory of creation, seven individuals of the baramin to which ibexes belong were housed in the ark. One of these was sacrificed along with one each of the other clean animals. The remainder reproduced and scattered or—and scattered and reproduced, and eventually found their way to the mountains of Persia and Tibet, and to the Himalayas, to the Caucasus, to the Alps, and to the Pyrenees, to Sinai, and to Abyssinia. Some stayed while others wandered farther. During the forty-odd centuries since the beginning of that distribution, geographical isolation in these mountain ranges has given mutation opportunity to change these groups sufficiently so that even though all of them are completely cross-fertile, our modern taxonomists have assigned different "species" names to them. This is the essence of the theory of special creation—it is dependent absolutely upon variation within the kind. If there ever was a group of scientists sold on the idea of *descent with change* (within limits) it is special creationists. It stands as one

of the anomalies of modern scientific theories that evolutionists should currently be obsessed with the idea that special creationists believe in descent *without* change.

VIII

We think how different might have been the history of biology if Darwin had only read for himself what the pure theory of special creation taught and had not depended upon the shallow interpretations of poorly read scholars for his conception of the doctrines of the theory. He, like Agassiz, was of the impression that the theory stated that each modern form was created and put bodily into its place. Evidently he also had missed the eighth chapter of Genesis and the statement that all land animals had dispersed out over the earth from one point. With that knowledge he would not have puzzled over the fact that the terrestrial fauna of the Galápagos Islands was definitely South American, nor that that of other oceanic islands was most like that of the nearest continent and not like that of more distant continents. Driven from the idea of special creation because of his unfortunately narrow conception of the theory, he turned to the fantastic idea of evolution. Even the creationist would agree with him that his theory of evolution was more sensible, i.e., more nearly in keeping with natural facts, than was his impossibly narrow and inaccurate conception of special creation.

We think how different would have been the story of biology if Darwin had had a correct conception of special creation. All the observations of his famous voyage and of the later quiet years on his estate would have fitted beautifully into the picture of descent with circum-

scribed change presented by the theory of creationism. Likewise, science could now be advancing in these fields instead of stalling in the pasture where evolutionary scientists, like good hounds who have lost the scent, are busily and distractedly dashing about trying to pick up a trail which has never been laid down. We hear much said about the progress that the conception of evolution has brought to the scientific world. The fact is that if evolutionists had not wasted a generation of hard work trying to pick up a trail which never existed, biology would be at least a generation farther along in the discovery of laws and processes which *do* exist.

IX

In an earlier chapter I have referred to the fact that the rapid progress in biological science, which began at the time the theory of evolution swept the scientific world, was not due to the theory of evolution but to the fact that science had finally broken the shackles bound around it by the medieval schoolmen with their inaccurate interpretation of the theory of special creation. The progress was a result of a belated experimentation with nature which was in harmony with its natural laws—the laws of physics and chemistry. The progress was not *because* of the theory of evolution but *in spite of* it. The pure theory of special creation points out the existence of these laws and of the descent with modification in the biological world. The present development of a breaking down of the explanation of purely mechanical operations in many biological processes is but additional evidence that the sidetracking of science on the false trail of evolution has in truth *slowed* progress where the theory of special creation

would have led straight on to the much more rapid discovery of natural truth.

In Darwin's time, when the first careful observations of processes of change in organic nature were just being made, and with the existence of only an impossibly narrow conception of special creation, there *may* have been some excuse for such a fantastic idea as that which entered his brain in the form of a belief that all life had arisen from simple one-celled forms. How does the evidence for change stand today? Change is to be seen on every hand among plants and animals. This is what Darwin saw, and it is what evolutionists are seeing today. Obviously change is taking place. But is any scientist justified in making a springboard of these changes, hopping up and down on the board a few times to assure himself of the fact of variation, and then springing from the observation of variation to the assumption of evolution?

X

If it were not so serious a matter it would be entertaining to make a study of college texts in botany and zoology and biology, and observe the type of material which is presented in these books as proof of the "fact" of evolution. We have already considered the evidence in the fields of classification, morphology, embryology, physiology, geology, and geographical distribution. We have found that the evidence in these fields is more harmonious and sensible when viewed in the light of the theory of special creation than from the point of view of evolution. When it comes to the presentation of evidence for evolution in the field of variation we would naturally expect to find a marshaling of the best illustrations available. Let

us examine these illustrations of the appearance of "new kinds of plants and animals."

In a popular college textbook of botany in the Central States area we find in a discussion of the evolution of life that the necessary material for evolution is the appearance of new "kinds" of plants. A part of the discussion goes as follows:

> "To develop new and better kinds of grains, fruit trees, and potatoes, is one of the main ambitions of many farmers and agricultural scientists; and their efforts have often been successful. Such well-known plant growers as Luther Burbank have provided us with many new kinds of plants which originated in their gardens from the previously known kinds. The record of the origin of many kinds and varieties of plants is incomplete, lost in the dimness of antiquity. The history of the sweet pea, *Lathyrus odoratus,* however, as a horticultural plant is known from the beginning." [6]

The discussion continues with a citation of the known fact that from one kind of sweet pea in the year 1700 have come the more than five hundred entirely distinct colors, tints, shades, and combinations of the Spencer, or waved, form alone. It is a matter of history that in the two centuries and more since the sweet pea was first used as a horticultural plant, at least a dozen distinct color mutations have arisen, as well as several mutations which involved changes in the size and form of the flowers and in the number of flowers borne upon a flower stalk. By no means all of the many hundred varieties of this plant have, however, arisen as seed mutants. The greater number have arisen by the hybridizing or crossing of different varieties which originally arose by mutation. The authors of the foregoing quotation also add, "Many other similar histories could be cited, for example the development of

[6] W. J. Robbins and H. W. Rickett, *Botany,* p. 525.

many varieties from the original Boston fern, which in turn came from a wild tropical fern." [7]

That these authors and all other evolutionists who use these illustrations are citing facts should not be denied. But the use made of these facts is plainly deceptive. The fact which is not made clear to the student is the difference between Genesis kinds and "kinds" of sweet peas and of ferns. In order for evolution to occur, new forms as distinctly different as Genesis kinds, e.g., sweet peas *and* ferns, must appear. But evolutionists too commonly fail to call their students' attention to the very obvious fact that after all these changes have occurred, we still have sweet peas from sweet peas and ferns from ferns. The evidence they present for evolution does, in fact, *not even suggest* evolution of one kind into another, but rather furnishes evidence that the theory of special creation is correct. Each organism still reproduces "after his kind."

XI

Another oft-cited case of variation is that of the descendants of the wild cabbage of Southern Europe, *Brassica oleracea.* It appears that such diverse modern vegetables as cabbage (*B. o. capitata*), kale (*B. o. acephala*), cauliflower (*B. o. botrytis*), and Brussels sprouts (*B. o. gemmifera*) have been developed from this wild "species" which grew along the coasts of southern and western Europe. Hundreds of varieties of cabbages, etc., have been developed in temperate climates from this single wild "species." This great diversity in modern forms which "are known to have been derived from a single wild species" gives the creationist a glimpse of what

[7] *Ibid.*

is very likely true all through nature. If the veil could be lifted from modern organisms it would in many cases doubtless be surprising to learn what has descended from single ancestors. It is in cases such as these that true "evolution," the only kind we find any real evidence for, has occurred. Darwin and evolutionists since his day have, however, mysteriously failed to observe that this is merely variation within definite limits. In this case there is not the slightest doubt but that cabbage, kale, Brussels sprouts, and cauliflower are members of a single kind. This is manifest in both morphological and physiological characters. Physiological identity is evidenced by their ability to cross. Here again the college student is presented with data which are said to prove that one kind has changed into another kind, when in fact we have but additional evidence that each brings forth "after his kind."

XII

In the field of zoology a very good illustration of descent with variation is furnished by the domestic pigeon. The diversity in form and temperament to be found among strains of pigeons would stagger our belief in their common origin if we did not know that they have all been developed from the wild rock pigeon of European coasts, *Columba livia*. It is extremely interesting to see the variations from the ancestral form which are exhibited in such strains as the pouter, the leghorn runt, the fantail, the tumbler, the owl, the turbit, the swallow, the carrier, the nun, the jacobin, and the homer. Different "species" names and possibly even different "generic" names would certainly be assigned to some of these if it was not known that they are merely strains of a common stock. Though

this material is repeatedly used in college texts as proof that evolution is going on in our day, still the evolutionist himself is very much aware that we start with pigeons and end with pigeons. Actually, no evolution of new kinds is occurring. The theory of special creation again offers the best explanation, each "after his kind."

XIII

What man has accomplished in the development of different breeds of dogs is indicative of the potentialities which may lie within all kinds of animals. It is almost more than we can comprehend that the toy poodle and the wolfhound are blood descendants of the same ancestor. Not only in external morphology but in mental differences the same wide variation is shown. We recognize the terrier's propensity for digging, the spaniel's curious love for water, and the tenacity of bulldogs. We recognize great mental differences between greyhounds and hounds, between both these and collies, and between all three and bulldogs. And still the fact stands that they manifestly had the same ancestor. Their origin through mutation and through processes of hybridization within the dog kind is a historical fact.

When selection is made with regard to one desired characteristic, it results in organisms very different from those developed within the same "species" group when another characteristic is used as the basis of selection; hence in numerous instances in livestock breeding widely divergent types arise from a common stock. For example, the large, meat-producing fowl, like the Cochin; the specialist in egg laying, like the Leghorn; the game cock and the tiny Bantam, are all probably derived from one

"species," the jungle fowl of India, *Gallus gallus*. There are hundreds of varieties of apples with the widest variation in color, size, flavor, and time of ripening; but the source of them all is probably the wild apple of Europe, *Malus malus*. The great lesson derived from such facts is that organisms are plastic and subject to change within certain limits.

But the serious mistake made by Darwin and succeeding evolutionists was to observe the fact of change and yet to ignore the fact that in *every* instance each kind of organism occupies a definite locus and is never able to pass the boundaries of that locus and become some other kind of organism. Again, I say, it is extremely puzzling that scientists continually overlook this fact. Apparently, acceptance of the idea of evolution makes it very difficult to recognize that variation within the kind is not the type of evolution which could possibly build our modern organic world from a few one-celled forms.

XIV

E. E. Stanford remarks:

> "During the past hundred years, organic evolution has become a cornerstone of biological belief. It has not been placed in this position without opposition. In the sometimes noisy evolutionary controversies in which individuals of little scientific training have seen fit to engage, debater and public have often forgotten that the idea of progressive gradual development has had to withstand the sternest scrutiny of more than one generation of scientists, of all men the most insistent on evidence and reason." [8]

The creationist never ceases to wonder how this "sternest scrutiny" of men that "insist on evidence and reason" has failed to observe that *variation is not evolu-*

[8] E. E. Stanford, *General and Economic Botany*, p. 622.

tion. If they do recognize this fact, then why do they continue to fill their texts with such purported proof for evolution in an attempt to foist it upon the credulous student who too often, as a matter of hero worship and of following the course of least resistance, swallows it down and says, "I am an evolutionist"? It does not require much observational power to see that sweet peas are still sweet peas, pigeons are still pigeons, and dogs are still dogs. The evolutionist, when reminded of this fact, usually replies, "Just give it time. All man's records cover but a moment of this earth's history." But right here is where the error in reasoning occurs. If present-day processes of change, even in the case of *Drosophila* under all the stresses and strains of its laboratory experience, cannot succeed in erasing the symphony of tangible and intangible characters which constitute that peculiar kind of animal we call a vinegar fly, how could they do it in a thousand million years? If no process of change is in existence which can make a new kind from an old kind, how will eternity do the trick? As we have already observed in an earlier chapter, if there is no natural process by which we can lift ourselves by our bootstraps today, how can we do it in a million million years? Can *time* supply that which processes of change do not possess?

XV

The evolutionist doubtless wishes that the creationist would describe the original Genesis kind for him more definitely. The creationist himself wishes such a description were possible. As already stated, the genus *Homo* is the only example which he is certain represents a single original kind, or baramin. Regarding any others he can

only guess. It may be observed in the Genesis record that the baramins were not demarked basically by morphological characters but rather by physiological characters, each reproduced "after his kind." There is no way of knowing whether several races may have been created in each original kind. But if such were the case, regardless of how they may have differed in appearance, they were able to reproduce according to their kind. The creationist assumes, very logically, that numerous ecological races may have been created, and that these were all cross-fertile within the kind.

Because of lack of available information on the subject, the creationist does not know whether the baramin would most nearly correspond to the modern "genus" or to the "family." But he has no doubt that there is little correlation between the original kind and any one of our present taxonomic categories. This is true because modern groups have largely been built on morphological characters, but the baramin was marked off on the basis of "blood relationship." With this fact clearly expressed in Genesis, it is logical for him to assume, as expressed in an earlier chapter, that the ability to hybridize would indicate membership within the same baramin.

The Genesis record states that all original kinds of terrestrial animals were preserved in the ark. Even though all land baramins came from the ark, still many of them have become extinct between that time and this. Examples of this almost in our own day are the passing of the moas, the dodo, the great auk, the Labrador duck, the heath hen, the passenger pigeon, and the quagga. Many antediluvian plants doubtless never survived the deluge and some others that did survive have since become extinct. In this way the creationist explains the presence

of fossil animals and plants which are markedly different from surviving forms. The fact that such "genera" as those of the oaks and the willows, the elephants and the tigers, are found as fossils but represented there by "species" which usually differ from modern "species," is explained on the basis of the continual variation that has gone on within the respective kinds since the deluge.

XVI

The discussion of the subject of variation is one that may be extended interminably, but we cannot extend it further here. The obvious answer to the question, "Evolution or variation within the kind?" is that the evidence is overwhelmingly on the side of the theory of special creation. In the chapters on processes of variation in organisms we found that although new races, "species," or possibly even "genera" are being built up, still in each case it is merely an increasing intricacy within the limits of the kind. Connecting links between the kinds are never established. Even though the vinegar fly be changed in a score or more characters from the wild form, still no zoologist would take it for anything but a vinegar fly. These distinctions between kinds are recognized from the "earliest" appearance of their ancestors in the rocks. The law of Genesis, each "after his kind," appears to be not only the law of reproduction but also the law which causes all changes to turn continually back within the limits of the kind. Darwin thought change was without limit, that the lid was off, as it were, but careful attention to facts reveals that the way of nature is not from simple organisms to more complex ones but rather a descent with limited change, the limits being the boundaries of the created kinds.

XVII

It is the opinion of some that it is impossible to either prove or disprove evolution or special creation in the laboratory. In the light of Dobzhansky's widely accepted definition of evolution which is quoted in Chapter One, I believe that such an opinion is inaccurate. Most evolutionists claim that their theory can be made or broken in the laboratory. Since evolution is a theory concerned entirely with natural forces, such a situation should be true.

On the other hand, with regard to special creation, the theory is first concerned with supernatural things. For this reason, the assumption that a Creator formed the first organisms is *not* subject to laboratory proof. The theory *is,* however, subject to laboratory *disproof. If* it can be shown that new *kinds* arise under the influence of natural forces, special creation is disproved. Contrawise, if new kinds do not arise naturally today, then nature gives the right of way to the creationist's theory.

Some claim that theories of origins are *purely* philosophical. In fact, Dobzhansky's evolution has no philosophy in it, and the theory of special creation is subject to disproof from real nature. Throughout the chapters of this volume I have taken special pains to direct the attention of the reader to the clear-cut testimony of nature that *natural forces do not give rise to new kinds.* By this fact the theory of evolution falls and the way is cleared for acceptance of the theory of creation.

XVIII

The schoolman of medieval times was very sure in his own mind that the earth stood still. His evidence for such a conclusion was entirely subjective but definitely con-

vincing to the majority of scientists of that day. He was so sure of his position that he was not slow in branding anyone with a different view a heretic and worthy of excommunication from the society of the schoolmen.

Three centuries have passed. The evolutionist of our day is very sure in his own mind that organisms have evolved from simple one-celled forms to the extremely complex patterns of the present time. His evidence for such a conclusion is entirely subjective but definitely convincing if exceptions and negations in nature are ignored. The large majority of modern scientists accept evolution. They are very sure that evolution is a fact, and most of them are willing publicly to brand anyone who is of a different opinion as being ignorant, dogmatic, or prejudiced. In many situations they are even ready to consider him of insufficient mental caliber to be admitted to the society of degreed scientists.

The evolutionist points to the great advance of science under the influence of the theory of evolution. Yet a careful reading of the record reveals that this advance was not *because of* but *in spite of* the evolutionary concept. The progress really resulted from a breaking away from the hidebound authority of the schoolman through a recognition of natural law operating, not in a mystical way, but through the laws of physics and chemistry. Progress resulted, not from a conception of unlimited evolution in nature but from a recognition of a wide variation in the great majority of organisms. Hence, it was not the conception of evolution but rather the acknowledgment of the operation of these real, natural processes which broke the bonds that shackled science during the Dark Ages.

The theory of special creation as portrayed in Genesis would have given recognition to the operation of physico-

chemical processes and to the fact of wide variation within the kind. Science under the guidance of such a theory would have manifested all the progress it showed under the influence of evolution *plus* the achievements in possible fields of the great minds who have wasted their efforts in an endeavor to prove blood relationship of organisms through the search for missing links and for natural processes which would bridge the abyss between kinds of organisms.

We deplore the slavery to a theory evidenced in the schoolmen which led them to threaten to ostracize Galileo because he had the courage to recognize the fact that the earth moved. If time were to continue three hundred years longer, is it not very possible that the theory of evolution, which likewise stands upon subjective evidence alone, would look as absurd in that day as does the theory of the schoolmen today?

In the light of this possibility would it not be much more fitting for those of our scientists in educational institutions who are engaged in the business of browbeating and bullying those who sincerely and with good reason differ from the current views of authority on the accomplishments of processes of change, to turn from such small business to the all-consuming task of correctly interpreting the phenomena of nature?

Scientific authority recapitulates the demonstrated facts of nature. Unjustified authority endeavors to thrust personal opinions regarding the operation of natural phenomena down the throats of those who may reasonably be of a different mind. The latter activity is to be deplored as soundly today as was its practice during the Dark Ages.

Science must ever be on the alert to circumvent among

its workers that type of authority which leads to enslaving adherence to a theory, and to foster instead that authority which accrues with acquisition of facts regardless of whether they prove or disprove the theories of the workers. Truly scientific workers are endeavoring to understand natural processes, not to salvage a pet theory.

There is hope that the truth regarding the origin of separate animate forms will yet become clearly manifest if we can forget our personal prejudices, and *even our theories,* as we once more turn to nature and sincerely inquire, Is it evolution of *new kinds* or merely wide variation within *already established and discrete units* which has accomplished the delightful diversity in our modern world of living things?

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